NOVEMBER 1953

American Engineer

RR

IN THIS ISSUE . . .

● **THE ENGINEER IN PUBLIC LIFE**

By Raymond R. Tucker, P.E.,
Mayor of St. Louis, Mo.

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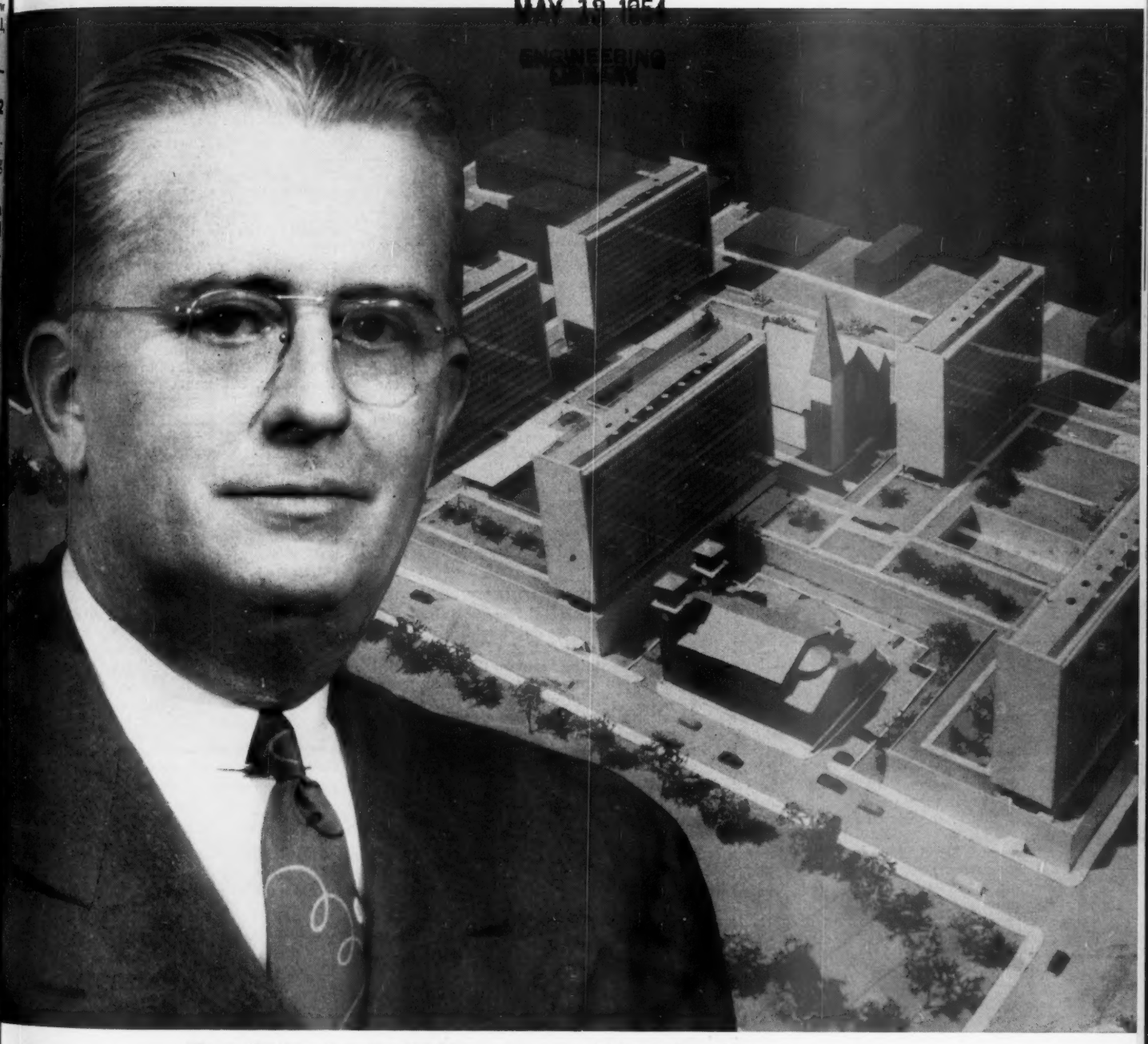


Mayor Tucker of St. Louis is shown with a model of a planned city improvement.

. . . *Also*

Bausch & Lomb's 100 Years
— A Photo Story —

●

Plus Articles and News on
Safety, Patents, Legislation

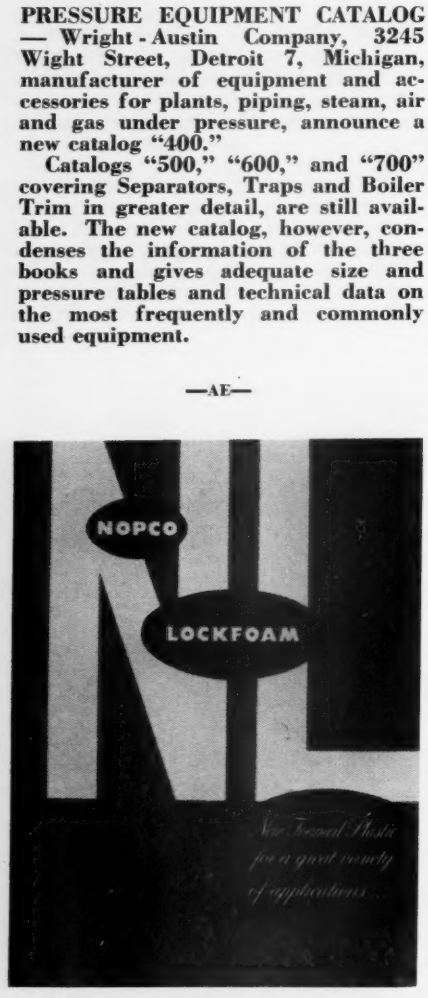
. . . NEW LITERATURE . . .

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

PRESSURE EQUIPMENT CATALOG — Wright-Austin Company, 3245 Wight Street, Detroit 7, Michigan, manufacturer of equipment and accessories for plants, piping, steam, air and gas under pressure, announce a new catalog "400."

Catalogs "500," "600," and "700" covering Separators, Traps and Boiler Trim in greater detail, are still available. The new catalog, however, condenses the information of the three books and gives adequate size and pressure tables and technical data on the most frequently and commonly used equipment.

—AE—



BOOKLET ON FOAMED-IN-PLACE PLASTICS — "Nopco Lockfoam — New Foamed Plastic" is the title of a new 28 page booklet just published by Nopco Chemical Company. Illustrated with over forty charts, graphs and photos, booklet outlines Lockfoam's many uses as a material for construction, electronic devices, packaging, reinforcement of automotive and aviation equipment parts, thermal insulation, athletic equipment, and vibration dampening.

The new "foamed-in-place" plastic will fill any cavity, regardless of configuration, lending itself particularly well to the strengthening of already-fabricated parts. In most cases, no redesigning of parts is necessary to make use of the foam.

Write: Lockfoam Division, Nopco Chemical Company, Harrison 57, N. J.

—AE—

LEFAX ENGINEERING DATA BOOK —Lefax Publishers, publishers of engineering data books, announce the newly revised "Engineering Formulas & Tables." It is listed in the new, free Lefax Catalog which also has over 2,000 other listings of technical data books in convenient pocket size. Write: Lefax Publishers, Philadelphia 7, Pa.

OXYCHLORIDE FLOORING BULLETIN — Oxychloride flooring, lightweight — high strength—fire resistant, has been widely used in commerce and industry and meets the service requirements of various types of occupancies.

Oxychloride Terrazzo provides a decorative, durable floor for lobbies and corridors. Solid-color, trowel-finish types are recommended for other areas in commercial buildings. Industrial Granolithic Oxychloride is recommended for factories and warehouses because of its resistance to oils, greases and abrasive wear.

Eight American Standard specifications for oxychloride composition flooring are now available from Oxychloride Cement Association, Inc., 1832 "M" St., N. W., Washington 6, D. C.

—AE—

ELECTRIC CONTROL CENTERS BOOKLET—Federal Electric Products Company has issued a new booklet describing the company's Noark Control Centers. Besides listing specifications and enclosure sizes, the booklet discusses the advantages of centralized control in a plant, describes exclusive features of the Federal Noark Control Centers, and shows photographic examples of typical control center installations. Other safety and efficiency features are also described in detail, and the "Noark" plug-in units are separately described and illustrated. Write: Federal Electric Products Company, 50 Paris Street, Newark 5, New Jersey.

—AE—

NEW CARBON BOOKLET — A new booklet on a special Extra-High-Purity Carbon raw material has been issued by Portland Gas & Coke Company. The booklet contains information of special interest to engineers, manufacturers, and purchasing agents who buy or use solid fuel or carbon for chemical, electro-chemical, or electro-metallurgical processes. Write: Portland Gas & Coke Company, Public Service Building, Portland 4, Oregon.

—AE—

FACT BOOK ON INDUSTRIAL EXPLOSIVES—A new 48 page book and catalog titled "Atlas Explosives Products" offers specific aid in the selection of industrial explosives for underground and strip mining, quarrying and construction, seismic prospecting, pipelining, agriculture, lumbering, oil field work and other areas.

The first fourth of the booklet summarizes in text and pictures the methods and explosive materials commonly specified for most effective and economical results in nine major industries.

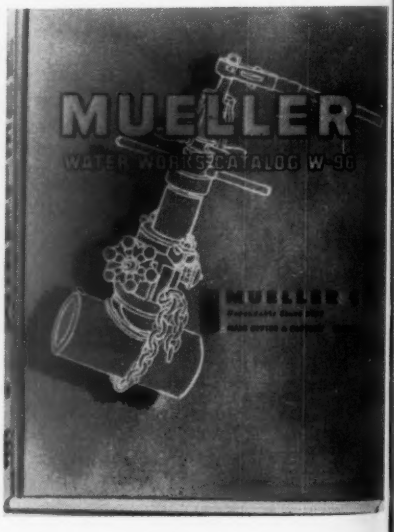
The catalog section describes and tabulates the properties of the various types of explosives, blasting caps, fuse, blasting equipment and accessories. Available from the Explosives Department, Atlas Powder Co., Wilmington 99, Del.

CONDUIT AND ELECTRICAL METALLIC TUBING—"Rigid Steel Conduit and Electrical Metallic Tubing for Electrical Wiring Systems," a twenty-four page, illustrated booklet, has just been published by the National Electrical Manufacturers Association. It tells how—with low maintenance expense—dependability of service, continued safety, and adaptability to changes in power loads can be assured with a well planned initial electric wiring installation, and how present systems can be expanded economically to take care of increased power loads not previously anticipated. Write: NEMA, 155 East 44th Street, New York 17, New York.

—AE—

FLOW METER CATALOG — An eight page booklet on the new Hays Diaflow Meter gives data on this meter for measuring air flow, gas flow, and the ratio of air flow to gas flow. Suited for industrial furnaces, sewage disposal plants, and cost accounting, it employs pilot method of operation; dry diaphragm-type measuring element; package unit construction. Write for Publication 52-1017-37, Hays Corp., Michigan City, Indiana.

—AE—



WATER WORKS CATALOG — A completely new catalog has just been published by the Mueller Co. covering its entire line of water works distribution and service products. This new Water Works Catalog W-96 supersedes all previous editions, supplements and literature pertaining to Mueller Water Works Products.

Catalog features an easy-to-use sectional indexing system to facilitate quick reference to any of the hundreds of products listed. Photographs and parts drawings are shown for nearly all items and a large section of useful information is included. Write to Dept. A-36, Mueller Co., Decatur, Illinois.

Letters

Employment Agencies . . .

Dear Editor:

This is in reply to the letter concerning employment agencies written by Mr. Elmer N. Iberg in the August issue.

The private employment agency in the larger cities fulfills a definite need in our economic life. It serves to bring together prospective employees who wish to sell their services and employers who wish to buy. In this function it occupies a position similar to the broker who sells real estate and others who perform similar services.

In common with other middle men an employment agency can be successful only if it enjoys the confidence of the community in which it operates. Those who attempt any of the practices mentioned by Mr. Iberg do not stay in business very long.

I cannot speak for other sections of the country but if Mr. Iberg can point to any agency in the New York area which indulges in unethical practices he will receive the full co-operation of any of the Employment Agency Trade Associations as well as the State of New York in bringing such offenders to justice.

However, the letter which Mr. Iberg wrote has implications which can and should be answered as he lists them:

1) He charges that employers and employment agencies have agreements to replace employees periodically in order to repeat fees. While this practice has been known to happen it has always been in small isolated cases. Any Employment Trade Association in the country would be happy to assist in punishing a member found following this practice.
2) His next charge is that Employment Agencies advertise jobs they do not have. The answer to this is quite obvious. Purely for economic reasons no agency can afford to pay the present sky high advertising rates for all of the jobs listed with them let alone advertising something which will bring no revenue. You cannot bring an applicant in on a $10,000 job and expect to sell him one at $7,500.
3) He charges that Employment Agencies are used to depress the going rate for the area. This can best be answered by anyone who will take the trouble to compare pay rates advertised by agencies with those paid in the area. No other comment is necessary.
4) He further says companies frequently utilize or establish a commercial agency to collect a fee from every person employed. In most of the forty-eight states where employment agencies are found in large numbers their ownership, fees and activities are carefully scrutinized and regulated by appropriate governmental bodies. Even where such regulation does not exist it would be difficult for any employer to derive a substantial benefit. Under most state and federal laws such an arrangement is illegal.

In short the best reply we can make is that an Employment Agency is a service business subject to the same economic laws that govern any other business, namely, that if you give people what they want and need, you will prosper and if you don't, you will surely fail.

MAXWELL HARPER
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New York, N. Y.

More Engineers . . .

Dear Editor:

May I add a few thoughts relative to the present shortage of engineers, as set forth in your answer to the letters of Mr. H. Millard and Mr. Robert J. Freund in the September issue of AMERICAN ENGINEER?

It is true that part of our present shortage of engineers is the result of the low birth rate in the '30's. However, as I view the situation there are other factors.

The induction of young men during World War II, when indiscriminate U. S. draft policies reduced the training of future engineers and scientists, is one factor.

Again—the Bureau of Labor Statistics made matters worse in 1950, when it indicated that there was a growing over supply of engineers for available jobs.

We engineers will find much of our present shortage on our own doorstep, and I disagree with the position taken by N.S.P.E., that there is little we can do with respect to the supply of engineers.

It is my personal opinion that our engineering societies in the past have not taken an interest in our high school youth as they should have done.

Three years ago, while I was president of the Toledo Technical Council, we inaug-

(*Continued on page 5*)

GOES PLACES IN NARROW SPACES—Revolvator Go-Getter Powered Hand Truck permits maximum use of storage or productive areas. The compact model shown above is a Hi-Straddle Lift with fingertip control —fully automatic 200° turning arc— slight operator training. Let us know your problem and we'll help you solve it. Phone or write Revolvator Co., 8782 Tonnele Avenue, North Bergen, N. J. Union 3-8120.

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1. We want to purchase a Sand and Gravel Washing Plant, new or used.
2. We want to arrange a long-term agreement with a Ready Mix Concrete concern.

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The sand and gravel crushing and washing plant should have two crushers to produce from 600 to 800 tons per day.

We have a gravel deposit of 23 acres which we own and we option small pieces adjoining our deposit of about a like amount. The top surface is 70% stone, 30% sand. Thompson & Lichtner Co., Inc., consulting engineers of Brookline, Mass. made a thorough study and survey of the deposit and samples taken by them from the property have passed a very high test. *Their complete report is available.* The R. E. Chapman & Co., well-water specialists, have taken tests and borings and assure us of 800 gallons per minute available water.

PROPOSITION NO. 2:

We're interested in a mutually profitable agreement on the washing and crushing and selling of the material at our property on Route 85 in Southboro, three miles from Framingham, Mass.

We want to secure some Ready Mix Concrete Concern to place the necessary machinery on our property—(we have a Railroad siding leased one mile from the deposit) and we will sell the aggregate to the Ready Mix Concern on a long term basis similar to other satisfactory agreements between several firms in the immediate area.

All zoning laws and necessary permits have been complied with.

We enter our pit from a main State Highway 65 feet wide.

Boston is less than twenty miles over the proposed new Super Highway which passes within 400 yards of our deposit. A twenty-mile radius would cover Boston, Worcester, Newtonville, Waltham and Franklin.

For more details, call or write:

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American Engineer

NOVEMBER, 1953

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Love of learning for its own sake is the hallmark of the liberally educated man.

—Harold W. Dodds, President, Princeton University

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(*Continued from page* 3)

urated a high school visiting program, speaking to all boys having qualifications for engineering. For three years this program was carried out, and the reports from the Dean of Engineering of the University of Toledo indicated an increased enrollment each year, due to this council activity.

I won't go into detail as to our program except to state that three prominent engineers met with the students, passed out literature for their enlightenment and answered any and all questions asked by the students.

If our engineering colleges would copy or co-operate with Dean Miller and Professor Skamser of Michigan State College in promoting engineering societies in our high schools, I feel that we would have a greater enrollment of engineers.

Again, I wonder if the engineering societies haven't passed up an opportunity by not working with the local, state, and national industrial arts associations. The teachers of industrial arts are in a natural position to encourage and counsel boys, who upon graduation may become candidates for college engineering courses.

In closing, from personal observation I find that few schools have the proper counseling program, and the guidance officer as a rule is not qualified for that office. Our administrative officers and, with very few exceptions, all high school teachers are arts college minded.

W. F. Rohr, P.E.,
Member, Ohio State Guidance Committee for E. C. P. D.,
Toledo, Ohio

Unity and P. R. . . .

Dear Editor:

It was a happy circumstance, in my humble opinion, that Mr. Shoch's article, "Design Factors in Engineering Unity," and that of Mr. F. A. Lewis, "Engineering Profession Needs Public Relations," were included in the same issue of the American Engineer, September, 1953.

For one, I cheer the editors for doing this whether or not it was by plan or accident.

If unity is important to our engineering fraternity, it is my personal opinion that it has its best chance of success based on professionalism. In line with this, it would seem then that the type of organization Mr. Shoch proposes is essentially that of N.S.P.E. Things of this kind take lots of time as is pointed out, and with continuance of strong, aggressive, sophisticated and mature leadership in N.S.P.E., further progress can be made.

As suggested, high on the list of activities under the direction of continually enlightened leadership is an aggressive public relations program, taking fullest advantage of *every* opportunity to present news items and news releases to the daily press, the general weekly press, and the trade press—particularly under the sponsorship of N.S.P.E. Although many engineers exhibit much modesty as regards getting their names in the paper, it seems to be a truism that other rallying points in the interest of over-all professionalism are the meritorious accomplishments of individual engineers either in their chosen field or in extracurricular work. The front page of the *New York Times* should be

(*Continued on page* 33)

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Professional News in Capsule Form

Traffic Engineers Advised to Heed Public Opinion • Need for Improved Industrial Productivity Cited • Senator Flanders Receives Standardization Award • Forrest Joins Texas Planners • Other Items of Interest

The National Science Foundation has established an 18-member permanent Advisory Panel on Minerals Research to advise the Foundation in developing policy on basic research in the field of mineral discovery and exploration. The membership of the panel is drawn from the mining and petroleum industries, universities, and government and includes: James Boyd, Kennecott Copper Company; Allen V. Astin, National Bureau of Standards; John G. Bartram, Stanolind Oil & Gas Co.; Alan Bateman, Yale University; A. H. Bunker, Climax Molybdenum Co.; G. L. Davis, Geophysical Laboratory; Maurice Ewing, Columbia University; Paul D. Foote, Gulf Research and Development Co.; L. C. Graton, Harvard University; John Gustafson, M. A. Hanna Co.; C. K. Leith and W. W. Rubey, National Research Council; Thomas Nolan and William Wrather, U. S. Geological Survey; Louis Slichter, University of California; John Vanderwilt, Colorado School of Mines; Clyde E. Williams, Battelle Memorial Institute; and Paul Zinner, U. S. Bureau of Mines.

* * *

Traffic engineers should check carefully to find out what the public thinks about their innovations to ease traffic congestion, according to John E. Baerwald, professor of traffic engineering at Purdue University. Citing the example of traffic signs posted in the wrong places until accidents highlight the need for shifting them, Professor Baerwald pointed out that, had motorists in the accident areas been questioned about the effectiveness of the signs, the crashes might have been prevented. The successful traffic engineer lets the public educate him, the professor said.

He offered this advice at the annual meeting of the Institute of Traffic Engineers held recently in Buffalo, N. Y. During the meeting he received the Institute's annual merit award for his paper on the subject of public opinion research as it applies to traffic engineering.

* * *

Industry must improve its productivity if America is to support the population of 200,000,000 persons expected by the end of the century, Dr. John T. Rettaliata, president of the Illinois Institute of Technology, said recently. The problem is complicated, he added, by present trends toward the reduction of the work week. "In all probability," he said, "a work week of 30 hours or less will materialize well before the end of the century. Thus, we are faced with the problem of satisfying the demands of an expanding economy for a greater flow of goods at the same time that the people producing the goods are working fewer hours." Only an advancing technology can "accomplish the miracle required and give men more goods with less work," he concluded, pointing out that technological educational institutions must play a large part in accomplishing this.

Dr. Rettaliata spoke at a banquet of the National Conference on Industrial Hydraulics at Chicago's Hotel Sheraton on October 8.

* * *

The 1953 Howard Coonley Gold Medal for "service in advancing the national economy through voluntary standards" has been awarded to Senator Ralph E. Flanders, Republican of Vermont, by the American Standards Association. The presentation was made during the group's annual award luncheon held at the Waldorf Astoria in New York City on October 21.

Senator Flanders, an engineer, has long been active in the standardization field and has written on that subject in the American Engineer (November, 1952).

* * *

NSPE President T. Carr Forrest, Jr., of Dallas, Tex., has been named to the Texas State Planning Commission by Speaker Reuben E. Senterfitt. Also appointed to the Commission at the same time was Datus E. Proper of San Antonio, chairman of the State Board of Examiners for Professional Engineers. Mr. Proper, like Mr. Forrest, is a prominent member of the Texas Society of Professional Engineers.

* * *

The completely automatic factory, manned only by a few technicians and a technical maintenance crew, is entirely feasible from the engineering viewpoint but probably not economically practical at present, according to R. C. Sollenberger, executive vice president of the Conveyor Equipment Manufacturers Association. In a speech before the Society for Advancement of Management at the Roosevelt Hotel in New York, Mr. Sollenberger explained that, before the economics of automation show profit, two conditions must exist: (1) a stabilized product, and (2) a continuing market with only minor fluctuations in demand.

* * *

The Mid-Century Conference on Resources for the Future, which is being sponsored by Resources for the Future, Inc., a non-profit corporation promoting research and education in the natural resources field, has been scheduled for December 2-4 in Washington, D. C. Norvell W. Page is director of the Conference.

* * *

He also pointed out, however, that, contrary to widespread belief, astronomical production in many fields is not necessary to make automatic operations profitable. "The elements of auto-

"Something about planning a dam."

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mation are often highly technical and complex, but they can be built in small units which will not require too much capital," he said. "It is possible that automation may bring about considerable decentralization of industry with groups of engineers and technicians working under what will be almost laboratory conditions."

* * *

"There are 60,000 graduate mechanical engineers at work in the United States, and the nation could use 40,000 more," Frederick S. Blackall, Jr., of Woonsocket, R. I., told the members of the American Society of Mechanical Engineers recently. Mr. Blackall, who is president of the society, made this statement in an October 5 speech at the organization's convention in Rochester, N. Y. He also said that the A.S.M.E. is pushing a campaign to encourage more students to enroll in accredited engineering schools.

* * *

Frederick H. Zurmuhleen, New York City Public Works Commissioner and a prominent NSPE member, has been awarded the medal of honor of the National Sculpture Society. The award, which was presented to Commissioner Zurmuhlen at an October 13 dinner, was made in recognition of his "vision and achievements in the cause of reintegrating sculpture and mural painting with civic architecture of today." Wheeler Williams, president of the National Sculpture Society, made the presentation.

* * *

The engineer has a big selling job to do in dealing with his "customers" —that is, primarily with other engineers, with management, and with the manufacturing, purchasing, and sales and advertising departments— Charles A. Maynard, vice president in charge of engineering and research at The Indiana Steel Products Company, Valparaiso, Ind., stated recently. It is, therefore, up to the engineer to "talk the common language" and to avoid confusing people by the over-use of highly technical terminology, he declared. "The engineer's problems as such mean little to his customers," he said. Fundamentally, those who must take the engineer's recommendation a step further in the manufacturing process want to know what it will do for them—such as saving money, time, or work, enhancing prestige, or making life more enjoyable.

Maynard, whose company is the world's largest producer of permanent magnets, delivered his advice in a paper read before a recent session of the National Electronics Conference at the Hotel Sherman in Chicago.

* * *

Daniel V. Terrell, dean of the University of Kentucky's College of Engineering, was installed as president of the American Society of Civil Engineers on October 21 during the Society's annual meeting at the Statler Hotel in New York City. Dean Terrell has been president of the Kentucky Society of Professional Engineers and also of the Kentucky Section of the A.S.C.E. He succeeds Walter L. Huber of San Francisco in his new office.

* * *

Consolidation of the North and Northeast Districts of the Corps of Engineers has been announced by Major General S. D. Sturgis, Jr., chief of Army Engineers. The merger will be effective December 1, and the consolidated area will be known as the Northeast District. Headquarters will be located in New York City, and an area office will be maintained in Iceland. Colonel Morton Solomon, who commands the present Northeast District, will be in charge of the consolidated area, which will continue under the Army Engineers' East Ocean Division.

The present Northeast District has jurisdiction over the construction of U. S. air bases at several locations in Greenland, while North District supervises the design and construction of a U. S. air base and supporting facilities in Iceland. It is expected that the merger will result in annual savings of approximately $400,000.

* * *

Dr. Gustav Egloff, director of research for Universal Oil Products Company, Des Plaines, Ill., and a member of NSPE's Inter-Society Relations Committee, played a leading role in the 75th anniversary celebration of the Chemical Society of Japan late in October. Dr. Egloff was one of only three non-Japanese and the only American invited to address the Society during the observance. He lectured in both Tokyo and Osaka and, in a special ceremony at the Tokyo National Museum on October 29, presented congratulatory honor scrolls from the American Chemical Society and the American Institute of Chemists to the Japanese association.

* * *

Major General K. D. Nichols, the new general manager of the Atomic Energy Commission and a West Point graduate, also holds two civil engineering degrees from Cornell University and has had a distinguished military career in the engineering and atomic energy fields. Among his posts has been included World War II service as district engineer for the famous Manhattan District where atomic energy research and activity was centered. Described by AEC Chairman Lewis L. Strauss as "a natural choice" for the new position, General Nichols is retiring from the Army in order to take over the AEC managerial duties. He succeeds Marion W. Boyer in the office, the change being effective November 1.

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Professional Status of Surveyors At Stake in Ohio Court Case

A somewhat unique court case in Ohio may lead to a legal determination of the question whether or not a licensed surveyor enjoys professional status in that state.

The case arose before the Common Pleas Court in Cleveland when a homeowner sued Surveyor Carl Gulla, claiming that he had made a mistake in surveying the property boundary and had caused the house to be built on five feet of an adjacent lot. The homeowner claimed that this error forced the purchase of the additional parcel of land and sought damages in the sum of $5,000.

Gulla denied the error but contended that even if it was established he could not be sued for it because such a mistake would constitute professional malpractice instead of ordinary negligence; the statute of limitations on professional malpractice suits being for one year only, and that one-year period had expired before the suit was filed. The homeowner contended that the four-year period permitted in ordinary negligence cases applied to the situation.

Judge Frank J. Merrick ruled in favor of the homeowner and held that the case should proceed to trial to determine whether Gulla was negligent, specifically denying his claim that the error, if any, was professional malpractice.

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Write for 1951 edition, Structural Welding Practice Manual.

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1953 Membership Program Set

The NSPE Membership Committee, under the chairmanship of Robert E. Allen of Dayton, Ohio, has announced its 1953 membership assistance program, stressing its flexibility in order that the State Societies and Chapters may adapt it to their own needs.

One of the new features of the 1953 program is the inauguration of a monthly Membership Memo by the Membership Committee. This publication will be sent to State and Chapter officers, with an extra copy of each issue for the appropriate membership chairman. It will report membership developments, announce available aids, and serve as an informational and coordinating device in the membership field. Other features of the program include new promotional literature for mailing to prospective members. The prospects are to be offered copies of the new booklet, "Every Man A Debtor," and a Digest of the recent Salary Survey report. Standard dues collection notices are to be made available to the State Society and Chapter secretaries, and other new aids will be presented as the program progresses.

Building Book Released

A comprehensive 68 page directory of those public officials of the Midwest States who administer and enforce codes and regulations governing building construction has just been released by the Midwest Conference of Building Officials and Inspectors. The new directory also lists the type of codes under which the governmental agency regulates building, plumbing, electrical, heating and related subjects. It is available for purchase at the office of the Conference, 207 Holliday Building, Indianapolis, Indiana, at $10.00 per copy.

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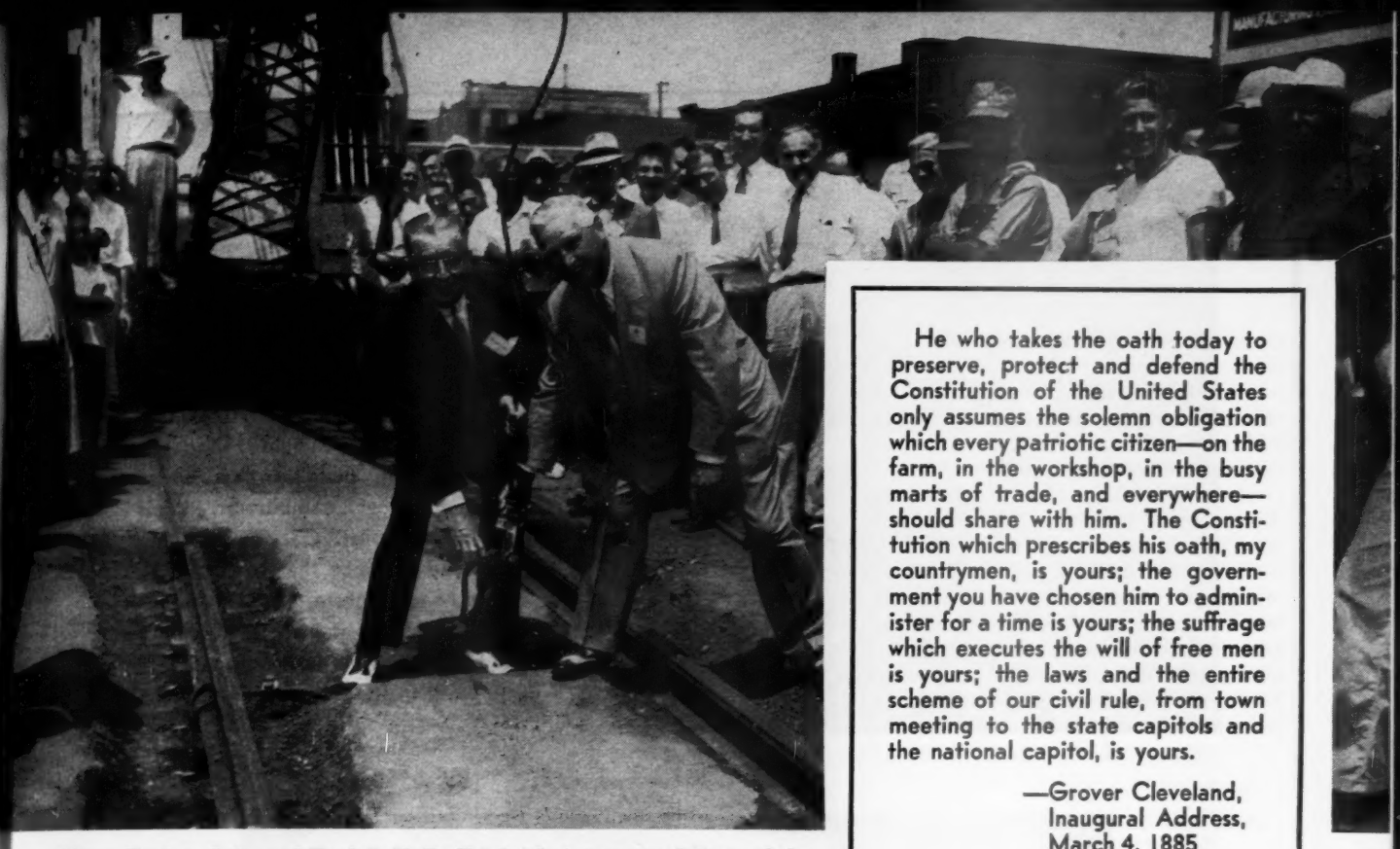


Mayor Tucker, left, and Paul J. Neff, Chief Administrative Officer of the Missouri Pacific Lines, at recent ceremonies commemorating the abandonment of five St. Louis grade crossings.

> He who takes the oath today to preserve, protect and defend the Constitution of the United States only assumes the solemn obligation which every patriotic citizen—on the farm, in the workshop, in the busy marts of trade, and everywhere—should share with him. The Constitution which prescribes his oath, my countrymen, is yours; the government you have chosen him to administer for a time is yours; the suffrage which executes the will of free men is yours; the laws and the entire scheme of our civil rule, from town meeting to the state capitols and the national capitol, is yours.
>
> —Grover Cleveland,
> Inaugural Address,
> March 4, 1885

THE ENGINEER IN PUBLIC LIFE

By RAYMOND R. TUCKER, P.E.,
Mayor of St. Louis. Member, NSPE.

A few months ago, one of the high schools in St. Louis arranged a vocational orientation program for the senior class. As is usual under such circumstances, practically all major vocational and professional groups were represented. One significant segment of our community life, however, remained without a spokesman. That segment was the public service.

The engineering profession, of course, had a fluent and personable representative. Upon the conclusion of his regular presentation, and after a few other pertinent questions from the seniors were raised and answered, a bright, young, feminine senior asked, "What about engineers in government service?" To this question the affable engineer replied, "Young lady, if any engineer wants to live a happy life, he will have as little as possible to do with government."

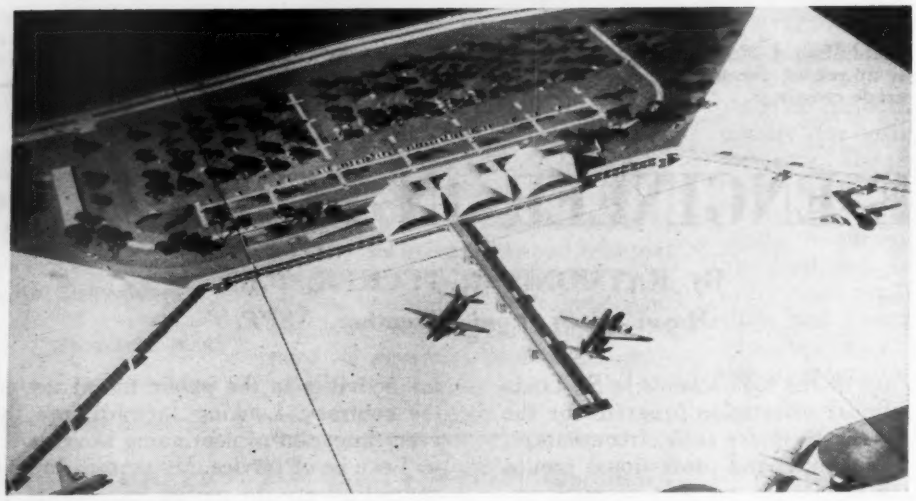
As a professional engineer for over thirty years, more than twenty of which involved direct participation in the public life of my community, and which culminated last April in my election as Mayor of St. Louis, I wish most emphatically to repudiate the political philosophy implied in that engineer's advice to his high school seniors last spring. My conclusions are based on actual experience, attained during the greater part of my adult life. I can state with enthusiasm and conviction that the opportunity for an effective, personally enriching, soul-satisfying life offered to the engineer in public service is such as can seldom be equalled, and never excelled. Looking back over the past twenty years, I can find no ground for regrets, either as a citizen or an engineer, because of my activities in the public life of my community—quite the contrary. Looking forward into the future, I have every intention of continuing to serve the public, so long as I can be of service. My reasons for this deep feeling of conviction are, to me at least, quite clear and logical.

In the first place, it is my firm belief, based on a considerable personal knowledge acquired by experience, that the professional engineer, by reason of his special skills and training, has more to offer his community than almost any other type of professional personnel. My own experience, of course, is almost entirely limited to the municipal level; hence it might be appropriate to illustrate my reasoning at this level. Most emphatically, it is no part of my intention to disparage the really noteworthy contributions made to civic progress, at all levels of government, by other than engineering groups. Nor do I believe that public life offers an opportunity for professional growth only to engineers. All vocations, and all professions, can find as much of challenge, of stimulation, of satisfaction, of effective living, in public service as in any other field of enterprise. But my basic point remains the same: for the engineer, the opportunity for truly great civic service is ever-present and extremely variable.

MUNICIPAL government is, in essence, a process of rendering basic services to the citizen—protecting his health and his safety, providing him with streets, lights, water, parks, playgrounds, libraries, zoos, disposing of his wastes, and regulating his individual activities in

St. Louis Progress Report

Left: Section of Third Street Interregional Highway, now under construction, which will provide rapid access from downtown St. Louis to outlying sections of city and county as part of a proposed $170,000,000 expressway program. Below: Model of Administration Building now under construction at Lambert-St. Louis Municipal Airport. Capable of being expanded to twice the size shown as future needs dictate, airport authorities have said that St. Louis facilities will be among the most modern, best equipped in the nation.



the interest of the common good. In virtually every significant field of municipal activity, there is a need and a place for the knowledges, the skills and the aptitudes of the professional engineer.

Examples of the validity of this contention are plentiful and varied. One good illustration can be found in the Survey of the Government of St. Louis, undertaken in 1941 by the Governmental Research Institute and Griffenhagen and Associates. Most attention, of course, was devoted to the subject of fiscal affairs—the budget and budgetary procedures, accounting, financial reporting, auditing, municipal insurance practices, assessments, collections and debt administration. Otherwise, however, the bulk of the survey was concerned with municipal services and institutions that were primarily related to one or another branch of engineering. Included on the list of such services and institutions, for example, were: the Municipal Bridge, the Division of Heat, Light and Power, the Water Division, Department of Streets and Sewers, Division of Parks and Recreation, Municipal Airport, Divison of Building and Inspection, Division of Smoke Regulation, and others like these. Effective functioning of these agencies in our municipal government, as well as of numerous others, calls for the application of engineering skill and know-how. To make the illustration more specific, and to relate it to a field of municipal activity with which I have had considerable personal experience, I should like to quote from the Survey itself:

> "The Commissioner of Smoke Regulation, who heads the division, is officially appointed by the Director of Public Safety, and *must be a trained and experienced engineer*, as must also the deputy commissioner and the inspectors."

In the same fashion, the City of St. Louis, like so many other large and diversified enterprises, required, according to the Annual Report for 1952 by the Civil Service Commission, a total of 68 engineers in its city service, subdivided as shown in Table I.

This total of 68 professional engineers represents .81% of the entire city staff of 8,339. It can be compared with other professional groups in the city service, as follows:

St. Louis Progress Report

Right: Lower section of storage bin of 400-ton-per-day rubbish incinerator being built in South St. Louis at cost of $1,750,000. Engineers and more engineers are needed to keep huge cities such as St. Louis "running on time."

Right: Rebuilding settling basins at Chain of Rocks Water Works. One grave responsibility of municipal engineers is to make certain that millions of people are daily provided with plenty of pure water.

Physicians—34 full-time, 110 part-time; Dentists—1 full-time, 2 part-time; Lawyers—26; Nurses—413. Obviously, such typical figures as these justify the conclusion that a significant number of professional engineers is needed in municipal service.

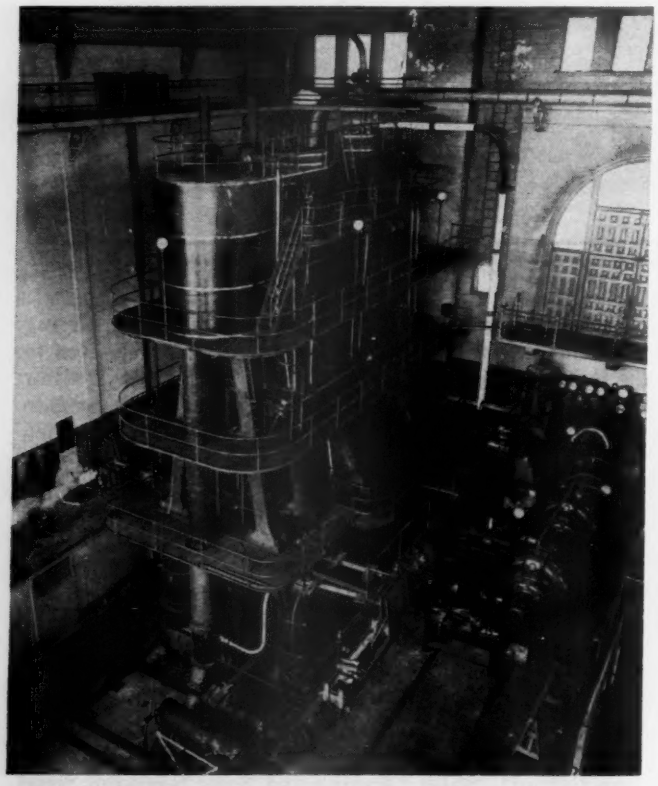
In every case, too, there is ample opportunity provided for full and well-rounded professional growth. That cities such as St. Louis are confronted with challenging problems in every field of engineering is obvious even to the layman. Solutions for these grave problems will allow engineers of every type of specialization to bring into play all the resources, skills and competence of which they are possessed. A recent issue of *The American City* (June, 1953) demonstrates the variety and scope of this professional challenge. Among 36 major items of subject matter listed in the table of contents, no fewer than 18, or exactly half, were primarily, if not exclusively, of engineering significance. These eighteen subjects included: Airports and Aviation, Billboards, Business Machines and Systems, Construction and Materials Controls, Housing, Industry in the Community, Lighting (outdoor), Planning and Zoning, Power ("Old Diesels Never Die"), Public Health, Public Safety, Refuse Collection and Disposal, Sewerage and Sewage Treatment, Shopping Centers (layout), Street Cleaning and Snow Removal, Street and Highway Construction and Maintenance, Traffic and Transportation, and Water Supply and Treatment. In other words, it would appear quite safe to say that half

TABLE I

Department Directors—Public Service, Public Utilities, Streets and Sewers	**3**
Commissioners—Traffic, Smoke, Water, Sewers, Streets	**5**
Civil	**39**
Electrical	**2**
Mechanical	**9**
Chemical	**3**
Planning	**3**
Public Health	**4**
TOTAL	**68**

of all the major problems confronting the modern city are engineering problems. Under such conditions as these, no engineer who is worthy of the name could fail to find, in municipal public life, an outlet for all his skills, energies and personal resources. In short, a career in public service, especially in municipal service, could be a source of deep personal satisfaction to the engineer.

WHAT of pecuniary rewards? Unfortunately, it seems to be true that a career in the public service for an engineer cannot compete with a career in non-public employment. The City of St. Louis, I believe, offers fairly typical compensation for engineers in all classifications, and the figures are not competitive. Beginning engineers in the civil, planning and public health services are paid at the rate of $3,860 to $4,250 per year. Electrical and mechanical engineers begin at $4,463 to $5,065. Chemical engineers are presently employed at salaries ranging from $5,913 to $6,571. These are, in each case, the salary ranges paid at the lowest levels in the service. Salaries in the higher classes, which require experience in addition to training, range from $6,800 to nearly $9,000. Departmental directors required to be engineers are paid at the rate of $10,000 a year. This maximum is fixed by Charter, and cannot presently be raised. Obviously, a qualified engineer with many years of increasingly responsible and varied experience behind him, could find pecuniary rewards higher than those available in the service of the public. But, in every other aspect of his work, the engineer could find public service at least as rewarding as any other type of employment open to him. It is my sincere hope, as a professional engineer involved in public service for more than twenty years, that more and more of my colleagues will come to realize the many advantages of a career in the public service. It is also my sincere hope that more and more public jurisdictions will come to realize that, in order to serve well-qualified personnel, they must compete on a more equal basis, salary-wise, with other employees.



Obsolete triple expansion vertical steam engine driven pumps (left) are being replaced by modern, compact centrifugal steam turbine or motor driven units of the type shown at the right at the Chain of Rocks Water Works.

There is, altogether aside from these considerations, another vital factor in the equation. Every engineer, like every doctor, dentist, nurse, lawyer, teacher, preacher, plumber, carpenter, coal passer or clerk, is a citizen. He shares with every other citizen the high prerogatives and the heavy responsibilities of citizenship. Thus he owes it to his community, his state and his nation, to be *active* as a citizen. He shares with all others the power to promote the general welfare; thus he must also share with them the responsibility for results. At the very least, he should function, regularly, consistently and thoughtfully, as a voter. Insofar as possible, he should work for the public good with and through other organized groups, especially with the political party of his preference. Finally, for those engineering citizens touched with the brush of natural nobility, there is the acme of public participation—standing for and serving in elective public office. Like Aristotle of old, I am convinced that there is no nobler occupation, none that calls for greater resources of intelligence, objectivity and integrity than elective public office. That such resources are not always either present or, if present, called into play, is no evidence that they are not needed. On the contrary, the public pain which results when public officials fail in their trust is in itself convincing testimony of the real need.

PERHAPS I am a bit biased in favor of my own profession. I have numbered engineers among my friends and associates for many years. Out of this knowledge, along with this slight bias, comes my belief that engineers, by training, by temperament and by experience, are peculiarly well-fitted for elective public office. They are, as a group: resourceful, objective and trustworthy. It is a rare thing indeed for an engineer, in or out of public office, to betray his trust and his profession. I am quite sure that public life can do with more engineers, both in civil service and in public office. As an engineer in the office of Mayor of St. Louis for the coming four years, I shall do everything in my power to uphold the ideals, the training and the experience of an engineer. I hope too, that in forthcoming years, more of my colleagues may find their way into the service of all of the people.—***End.***

Mayor Tucker

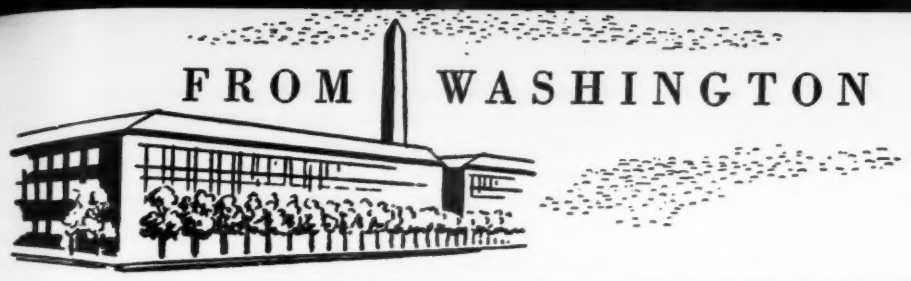
About the Author . . .

The Hon. Raymond Roche Tucker, who was elected on April 7, 1953, to a 4 year term as Mayor of St. Louis, was born in that city on December 4, 1896. He obtained a B.A. degree from St. Louis University in 1917, and a B.S. from Washington University in 1920.

Mr. Tucker first entered public office in 1934 when he was appointed secretary to Mayor Bernard F. Dickmann. During that period he was also active in St. Louis' successful smoke elimination program. He served as the city's first Smoke Commissioner and later was Director of Public Safety under Mayor Dickmann.

In July, 1942, Mr. Tucker resigned from public office to accept a position as chairman of the Department of Mechanical Engineering at Washington University where, for thirteen years before becoming secretary to the Mayor, he had been an associate professor of Mechanical Engineering.

The new Mayor's last major public office was Civil Defense Director of St. Louis, which position he held from January 27, 1951, to February 5, 1953, when he announced his candidacy for the Democratic mayoralty nomination. While serving in that capacity, his work attracted national attention to the city for its progress in developing a defense program and won for him the "PAGE ONE" Award for civic achievement from the St. Louis Newspaper Guild.



FROM WASHINGTON

By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

Although Congress will not return to its labors until next January, there is considerable legislative activity in progress by NSPE, particularly in connection with the important question of amending the Taft-Hartley Act to provide Freedom of Association for professional engineers. Through the medium of "Operation Grass Roots," the State Societies and Chapters, as well as many individual members, are contacting the members of Congress while they are "at home" among their constituents.

Basic background and informational material on the Freedom of Association principle has been made available to those engaged in this work. President Forrest has issued the following Question and Answer Sheet to aid in the understanding of the problem. It is printed here because it deals with a complex problem in as simple a form as possible. Members may desire to retain this information for use next year when amendments to the Taft-Hartley Act, including the Freedom of Association bill, will be "hot" issues.

Rep. Kearns

* * * * *

1. Q. What is meant by the phrase, "Freedom of Association," as applied to professional engineers?
   A. It means that professional engineers employed by industry should have the right to associate through an organization which includes ALL the professional engineers of a company, for the purpose of discussing and seeking solutions to problems in the professional field of interest as applied to the particular company.

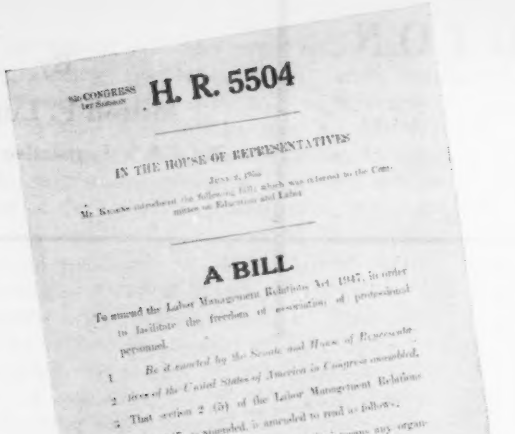
2. Q. Don't such organizations exist now?
   A. Yes; but they are seriously handicapped in meeting their objectives because the companies are reluctant to cooperate fully due to the possible effects of the Taft-Hartley labor law.

3. Q. Is the purpose of the professional engineers' organizations to negotiate with management and arrive at conditions of employment on wages, hours, working conditions, etc., i.e., collective bargaining?
   A. No. Organizations of this type are not collective bargaining agencies, do not negotiate with management and do not seek collective bargaining contracts. Neither do they wish to operate in such fashion.

4. Q. More specifically, what is their purpose?
   A. To bring ALL the professional engineers in the company together for mutual discussion of mutual problems dealing with professional practices, efficiency of operation, etc. For example, what is the best policy and procedure within an industrial organization on the rotation of professional engineers when first employed in order to give the young engineer rounded and broad experience in the company's engineering operations; what procedure is best for the professional development of the individual; what will be the effect of a certain plan on the company's operations; and how will a certain plan affect the various engineering department functions? This is the type of problem in which the organization is interested.

5. Q. What is the problem in implementing the purpose?
   A. The problem stems from the fact that the Taft-Hartley Act operates to prevent supervisors (who are management representatives) and non-supervisory employees from joining forces through a non-bargaining association because the presence and activity of the supervisors in the organization may lead to a charge that the organization is dominated by the employer. Professional engineers, like all others subject to the Taft-Hartley Act, come under one of the two categories; either they are supervisors, as defined in the law, or they are "employees." The Taft-Hartley Act contemplates in effect that these two groups shall be "opponents" and shall reconcile their

(Please turn the page)



86TH CONGRESS
1st Session

H. R. 5504

IN THE HOUSE OF REPRESENTATIVES

JUNE 8, 1959

Mr. KEARNS introduced the following bill; which was referred to the Committee on Education and Labor

A BILL

To amend the Labor Management Relations Act, 1947, in order to facilitate the freedom of association of professional personnel.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 2 (5) of the Labor Management Relations Act, 1947, as amended, is amended to read as follows:

"(5) The term 'labor organization' means any organization of any kind, or any agency or employee representation committee or plan, in which employees participate and which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work;

differences through the medium of collective bargaining. Professional engineers, whether they be "supervisors" or "employees" do not regard themselves as "opponents" and wish to resolve their problems together, without resort to collective bargaining.

6. Q. More specifically, how does the Taft-Hartley Act prevent the desired procedure?
   A. The Taft-Hartley Act says that any organization of any kind which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work, is a "labor organization." In the hypothetical problem, mentioned in question #4, discussion with the "supervisory" members of the engineers' organization or with other management representatives may be construed as dealing with the employer on conditions of work; therefore, the engineers' association may be held to be a "labor organization" from a technical legal standpoint.

7. Q. Why is this important if it is only a legal technicality?
   A. If the engineers' association is held to be a "labor organization" another provision of the law comes into play. This says that the employer is forbidden to "dominate" or "interfere" with the formation or administration of any "labor organization." There are many ways in which a finding of domination or interference by the employer have been found to constitute sufficient evidence to justify an unfair labor practice charge, including the mere presence and active participation of "management" or "supervisory" personnel in the organization. If the employer encourages or permits his supervisory engineering personnel to be an active part of the engineers' organization or fully cooperates with the engineers' organization in seeking solutions to the professional engineering employees' problems, an unfair labor practice charge may result. Employers do not relish such an expensive and time-consuming, as well as embarrassing, charge and therefore are likely to "lean over backwards" to avoid any type of cooperation or dealing with the engineers' association which might lead to such a situation.

8. Q. Why is it necessary for the professional engineering associations to include the engineers who are supervisors and therefore representatives of management?
   A. Because only by bringing ALL the professional engineers together to discuss the problems can a truly professional approach be taken, all viewpoints considered, and the benefit of "management" experience in the problem as well as "employee" experience be balanced. Also, it is a well known fact that the "employee" engineer of today often becomes the "management" engineer of tomorrow. More important than the separation dictated by the law is the principle that ALL of the engineers of the company have the mutual background of being part of the same profession.

9. Q. Doesn't the law now provide separate treatment for professional employees?
   A. Yes. One of the provisions of the present law says that professional employees (who are defined in the law) may not be included in a voting unit to determine collective bargaining desires if that voting unit contains non-professional employees, and this provision permits professional employees the right of a separate and independent choice on affiliation with a union, the type of union affiliation or the right to reject collective bargaining. This provision, however, does not resolve the "freedom of association" problem because it does not permit the further choice of allowing professional engineer "employees" to band together with "supervisory" professional engineers through a non-bargaining group.

10. Q. What can be done to correct this situation?
    A. The solution is to amend the law, making it clear that organizations of professional persons which include both "supervisors" and "employees" and which are not certified as collective bargaining organizations or which are not recognized by the employer as a collective bargaining organization, are not "labor organizations" within the meaning of the law. This change in the law will lift the invisible curtain which now separates members of the same profession into two distinct and separate categories.

11. Q. Has this problem been presented to Congress?
    A. Yes. NSPE testified on this problem before the Senate and House Labor Committees and presented a recommended change in the law.

12. Q. What is the status of the situation?
    A. A bill to change the law along the line recommended by NSPE has been introduced by Representative Carroll D. Kearns of Pennsylvania, a member of the House Labor Committee. His bill, known as H.R. 5504, is pending before the Committee and will be considered by the Committee next year along with many other proposed changes in the Taft-Hartley Act.

BAUSCH & LOMB'S 100 YEARS

An American Engineer Photo Story

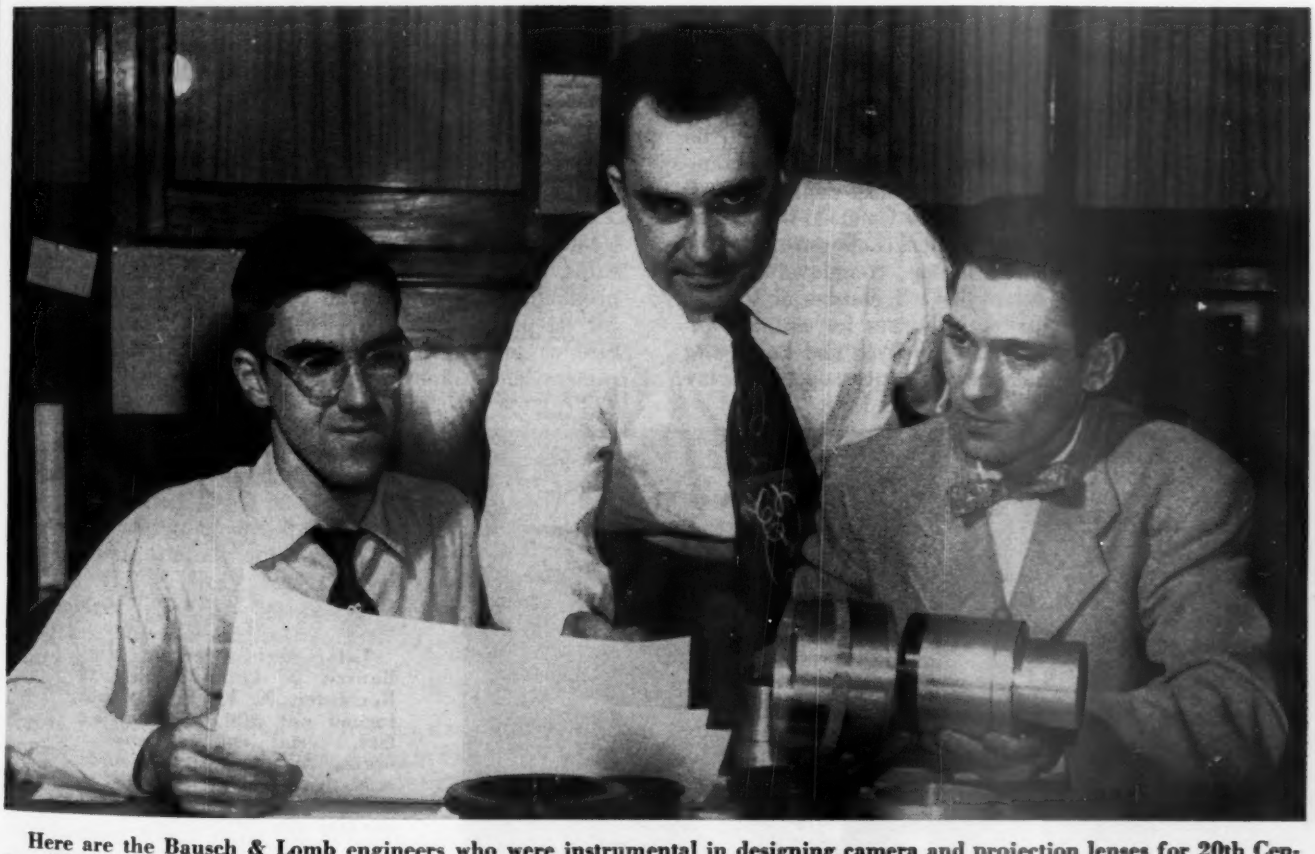
EXACTLY one hundred years ago—in 1853—a young German immigrant, John Jacob Bausch, borrowed sixty dollars, the life savings of his friend, Henry Lomb, to help expand the small optical business that he had started in Rochester, New York. He promised Lomb, also German-born, that if he ever needed a partner, he would take him into the business on equal terms, and that event shortly came to pass.

From that small beginning and that verbal agreement (the two men never had a written contract between them) has grown the world-renowned Bausch & Lomb Optical Company whose name is synonymous with optical quality and engineering precision. A far cry from the small shop in what is now the Reynolds Arcade Building in Rochester, the 1953 B&L plant includes 1,500,000 feet of floor space covering 35.1 acres. More than 8,000 workers are employed, including those in additional factories in Wellsville, New York; Midland, Ontario; Rio de Janeiro, Brazil, and in 178 branch offices scattered throughout the world.

Since 1949 alone, over 40 new B&L products have been developed largely through the efforts of the more than 300 engineers, physicists, chemists and technicians who make up the Research and Engineering Division. These include 3,000,000 Balrim eyeglass frames, a series of Stereomicroscopes for industrial research, television lenses and projectors, multi-focal eyeglass lenses, illuminated magnifiers, fog-proof telescopic rifle sights, refractometers, and other like items.

Actually, the history of the company is comprised of a long list of "firsts." It was John Bausch's Civil War time discovery that hard rubber could be used as a suitable material for "plastic" eyeglass frames that led the partners to turn from the retail distribution of spectacles to manufacturing. With the water power of the Genesee River readily available, they had an unusual opportunity for expansion. And, by 1866, Bausch had also devised and installed the first power lens grinding machine in the United States in his first small manufacturing plant located near the river. During this same period, he also invented the first nosepiece for eyeglasses and began turning out engravers' and watchmakers' loupes, linen testers, and pocket magnifiers. By 1874, business had expanded so greatly that the company had to move again to the first building at the present site of the huge B&L plant.

About this time, too, Edward Bausch, son of the founder and an engineering graduate of Cornell, developed the first Bausch & Lomb microscope; and soon afterwards commercial production began, thus bringing the company into the scientific optical instrument field. At the time when Edward Bausch was developing his various microscopes, which, incidentally, won awards at the Philadelphia Centennial Exposition, there were fewer than 100



Here are the Bausch & Lomb engineers who were instrumental in designing camera and projection lenses for 20th Century-Fox' new wide-screen process, CinemaScope. Left to right are Erwin Delano, Charles DeGrave and Arthur Neumer.

Above: Approximately 22 hours are needed to complete the melt under accurate control of all furnace conditions. Here the molten glass, like a giant pot of taffy, is to be poured on a cast iron table for rolling into a sheet. Right: Instead of the messy red rouge used throughout the optical industry for years, Bausch & Lomb has adopted a white zerox solution as the abrasive compound. Here an operator inserts a lens into a semi-automatic polishing machine in the firm's new single vision lens plant.

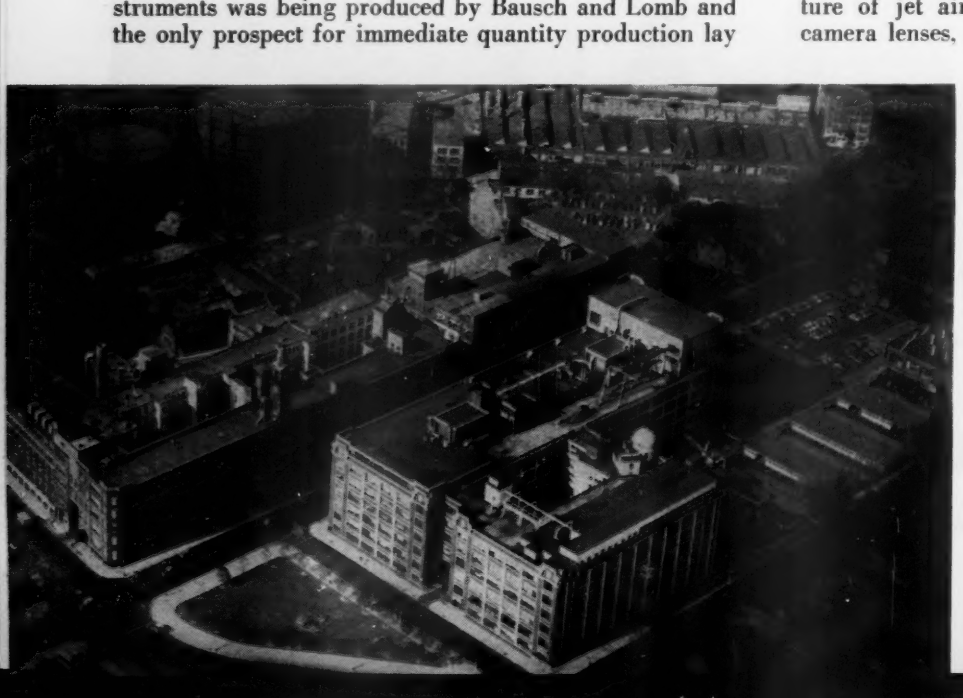
such instruments in the United States. By the beginning of its centennial year, however, the company had produced more than 600,000.

ANOTHER pioneer effort of the company was directed toward the domestic production of optical glass. Prior to the first World War, optical glass was supplied from abroad, but the German, French, and English glass makers had never divulged their manufacturing formulas and there was practically no literature available on the subject. In 1912, however, William Bausch, another son of the firm's founder, had begun experiments in the optical glass field; and by 1915 the B&L plant had produced America's first commercial melt of the valuable product.

In 1917, just before the United States declared war on Germany, the Naval Consulting Board reported that imported stocks of optical glass were almost depleted; and, at the request of the National Defense Council, Dr. Arthur L. Day, director of the Geophysical Laboratory of the Carnegie Institution of Washington, conducted a hasty survey to determine the extent of U. S. sources of supply. He reported that the only optical glass for military instruments was being produced by Bausch and Lomb and the only prospect for immediate quantity production lay there. Rising to meet the challenge, with the assistance of government-assigned scientists, the Rochester firm built new furnaces, developed new formulas, and trained additional workers until the amount of optical glass it was producing for binoculars, range-finders, submarine periscopes, and other military instruments had increased from 2,000 to 40,000 pounds per month. More than 65 per cent of the United States' wartime consumption of optical glass was thus supplied.

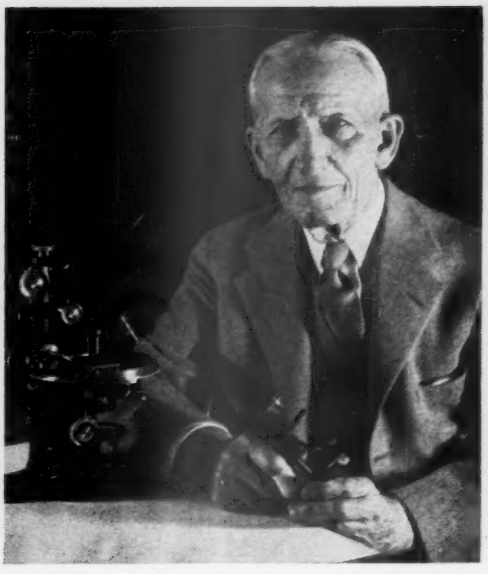
Concurrently, too, the company stepped up its binocular production from 2,000 a year to 4,500 a week, and its achievements were accorded public recognition by the presentation of the War Department's Distinguished Service Award.

The story of vital wartime contribution was repeated during World War II, when the company produced complicated gunfire control equipment, as well as nearly 300,000 binoculars, aerial camera lenses, optics for bombsights, and analytical instruments for companies making ships, tanks, and planes. And it has also contributed to production for the Korean conflict with plastic helmets for jet pilots, optical devices necessary to the manufacture of jet aircraft, tank sights, newly-designed aerial camera lenses, and many other items.



Left: Aerial view of the Bausch & Lomb plant at Rochester, N. Y. This plant turned out 300,000 binoculars, aerial camera lenses, optics for bombsights, and analytical instruments, used by our Armed Forces during the late war.

Dr. Howard S. Coleman (left) director of the Scientific Bureau of Bausch & Lomb, and Carl L. Bausch, vice-president in charge of Research and Engineering, view one of the firm's new color filters for motion picture projection.



This photo taken of Edward Bausch before his death on July 30, 1944, shows him holding the first B&L microscope he produced in contrast to one of the firm's later models.

In recent years, the company has put particular stress on plant modernization, engineering, product development, and improved sales and service facilities in its branch offices. The engineering achievement to which it points with greatest pride, and which has been termed an "engineering miracle" by top technical writers, is the new Single Vision Lens Plant in Building 7 in Rochester. The new facility and its ultra-modern equipment were designed by a team of B&L engineers and technicians, many of them very recent college graduates, to whom was handed the assignment of speeding up and literally cleaning up the lens manufacturing process.

For years, the grinding and polishing of lenses had involved mounting three to twelve lens blanks on large cast iron blocking shells with pitch. The shells then were loaded into two-deck machines for grinding with loose abrasives and polishing with red rouge. Rough and fine grinding took forty-five minutes each. Then the polishing took approximately three hours, and all three operations had to be repeated on the reverse side of the lens. Travel distances for the process averaged around 5,600 feet, and an even bigger problem was the unsightly "housekeeping" situation created by the great quantities of pitch, loose abrasives, water, and red rouge covering machines, tools, floor, and operators.

In the newly engineered plant, which was designed as a pilot operation giving promise of even greater efficiency to come, diamond milling has largely replaced the use of loose abrasives in the lens manufacturing process. The old-fashioned red rouge has been eliminated in favor of a new polishing agent—zirconium oxide, or Zerox, a material pure white in appearance which has controllable chemical and physical properties and produces an excellent surface finish. Operating cycles have been cut to a fraction of the time that was formerly consumed, and the travel distance has been reduced to about 760 feet.

Lens blanks now follow a straight flow-line as they move from machine to machine. A single blank is inserted in a precision chuck in the high-speed B&L spherical generator, and in ten to twenty seconds a small diamond-impregnated wheel mills the concave surface to the desired base curve. Special trucks then take trays of lenses to near-by semi-automatic machines for fine grinding and polishing. The convex side of the lens is prepared through two major B&L developments—a semi-automatic blocking process which mounts the partly finished lens on a precision block over a specially developed blocking compound, and a milling process during which a rotary turret diamond generator completes both rough and fine milling in a period of about 22 seconds. Finally, the still-mounted lens is polished in a specially-engineered polishing machine as Zerox solution flows over it; and then, as a result of quick chilling at 40° below zero, the lens virtually pops off the block. It then is processed through a continuous automatic washing unit also designed by the Bausch & Lomb engineers, and the finished uncut lens is ready for final inspection of surface, power, centering and thickness.

Thus Bausch & Lomb offers another substantial proof that good engineering is one of the essential factors in the continued progress of the optical industry. And, as the company officials themselves point out: "Proper performance of every optical product—Retinal Camera or spectacle lens, Research Metallograph or simple magnifier—involves much more than glass quality and precision manufacture. Equally important is the proper engineering to meet specific needs.—***End.***

On the left is pictured Mr. Joseph F. Taylor who is president of the 100-year-old Bausch & Lomb Optical Company.

On the right is shown Mr. Carl S. Hallauer, Executive Vice President of the well-known optical firm.

Dread or Pleasure . . .

THE ENGINEER AS AN EXPERT WITNESS

By S. S. AIDLIN, P. E.
Consulting Engineer, New York, N. Y.

THERE comes a time, to be anticipated with dread or with a degree of pleasure by the professional engineer. This is the occasion when he is called into court to testify as an expert witness relative to a phase of engineering with which he is quite familiar. Generally, the occasion is one involving a law suit with considerable sums of money in the balance and the legal decision largely dependent upon the information furnished by the professional engineer.

Others who are not duly licensed professional engineers may possibly be brought into the picture to serve as expert witnesses relative to specific issues. But recent court rulings have apparently given greater credence to the testimony of the professional engineer, just as the license of the medical doctor carries greater weight in issues involving medical questions. This is based on the recognized principle that the licensed practitioner is bound not only by well-formulated Canons of Ethics, but by an extensive examination of his ability in the art and practice of his profession. Thus he is qualified on two counts, his ability and his moral standards. In addition, there is the implied understanding that his professional conduct is subject to review by the same licensing board that granted the license and that it may be revoked in cases where his conduct is detrimental to the profession or otherwise unworthy of the license.

The author of this article has appeared in court a number of times as an expert witness and the following comments and observations are largely based on personal findings and considerations.

When the professional engineer does appear in court, his qualifications are usually not challenged by the opposition. However, it is wise to state one's qualifications in order to impress the court and jury. Qualifications are sometimes challenged on the following grounds:

A. If one is a specialist, his field may be too narrow to encompass the immediate issue.

B. If one is not a specialist, his field is too broad to know enough about the specific issue.

C. If one is old, he may not be conversant with the latest developments and advances in the profession.

D. If one is young, he may lack adequate experience to qualify.

It seems best, therefore, to present one's knowledge on the subject. Generally speaking, a witness can be cross-examined only on what has come up on direct examination. Therefore, it is advisable to adhere to simple facts, stated in generally understood terms rather than in highly technical language. The latter may be misunderstood, or worse, its meaning may be distorted by the opposition.

To give a specific example, in a recent court case wherein the author was testifying, the question was whether there was attempted fraud on the part of a contractor in selling and installing a central heating furnace and boiler which were inadequate for the building where installed. A heat balance was made and it developed that a vendor's proposal (which became part of the subsequent contract) was for a properly rated boiler. However, the unit installed bore no name plate data nor any recognizable professional rating. Tests indicated that the unit could not get up enough steam to provide adequate radiation for comfort heating and the contractor contended that the piping was at fault (which was not included in the contract).

In the presentation of the engineering witness's findings, he did not refer to equivalent square feet of radiation, BTU's, heat transfer coefficients, etc. Instead, it was pointed out in simple language that the boiler lacked adequate volume for proper firing of the required oil for suitable heating of the premises, that the boiler surfaces exposed to the heat of the fire were inadequate for development of the required amount of steam. The evidence offered was personal observation and opinion based upon previous experience, comparison with accepted well known rated boilers and recognized trade and professional standards. (The verdict handed down was as we expected.)

Frequently, the opposition will attempt to trip up the professional engineer testifying by attempting to lead him into an argument. The witness should adhere to the facts without losing control of the situation by arguing. The lawyers generally win in such instances.

In addition, when asked if the engineer has made a complete examination or analysis there is an attempt made to confuse the witness because a *complete* investigation is virtually impossible. Instead, a proper answer should be that the investigation was as extensive as warranted.

Inasmuch as writings, as such, are not subject to cross-examination, they are generally not admissible as evidence. However, such material may be considered as corroborative evidence and may be introduced in such a manner. But it may be introduced by the opposition in an effort to becloud the issue or to cast doubt on the evidence of the engineer. Before doing so, the opposition may introduce the writing and ask if the witness (the engineer) considers the author of the writing as an authority. There are several possible answers that may be offered by the witness:

1. May not consider the author an authority.

2. May explain that the writings are out of date and that the beliefs or opinions outlined therein are superseded by more advanced ideas in the profession.

3. May consider the author an authority in certain respects only. This prepares an opening in the event of a subsequent disagreement between the author and the witness.

In any event, it is wise for the witness to prepare himself with reliable writings by others or his own which have been sponsored by or published by recognized authoritative groups such as professional or engineering societies. However, it is best not to cite these writings until the opposition has introduced others, because this affords an opportunity to refute contrary opinion.

IN the matter of fees, the opposition will attempt to influence the jury and to cast doubt upon the evidence of the

(*Continued on page* 33)

Editor's Note: This material is a chapter taken from the book by Mr. Aidlin, *Professional Engineering—Economics and Practice*, published at $3.00 by Pelex Publishers, Inc., 165 Broadway, New York, N. Y.

Safety Is a Subject Familiar to Many Professional Engineers, but Few of Us Realize Just What An Important Field It Is. Read How Engineers Are Taking Steps to Reduce the Annual Accidental Toll of 15,000 Deaths and 2,000,000 Injuries.

Safety Is Our Business

By JOHN T. RYAN, JR., P.E.,
President, Mine Safety Appliances Co., Member, NSPE

Thirteen ounces of plastic prevented almost certain death for Ironworker John W. Stark. An employee of a subcontractor for Dravo Corporation, Mr. Stark was welding in the sub-floor of a new power plant near Pittsburgh, when a 26-inch pinch bar slipped through a foot-wide opening above and plummeted 29 feet. The flared blade of the bar pierced the crown of Mr. Stark's Skullgard, but the built-in wire mesh reinforcing stopped the three-and-one-half-pound bar. The protective hat is a development of Mine Safety Appliances Company.

One of the greatest tributes to the engineering profession is that it has made all kinds of human activity safer—less costly in terms of personal injury and suffering, in materials, in production, in dollars.

The professional engineer has studied and evaluated the multitude of hazards inherent in mine and factory, in mill and aircraft and ship, in the home and on the street. His study has led to the detection of dangers oftentimes obscured by the complexity of an operation or the newness of a material. And he has applied his broad knowledge of physics and chemistry, and related special knowledge, to developing means to prevent accidents before they occur.

A few decades ago the structural iron worker proudly identified himself with a jaunty derby hat—padded with paper to protect his head against falling objects and swinging beams. The professional engineer, pooling the scientific knowledge of the chemist, the physicist, the anatomist, and others, removed that ineffectual symbol from the iron worker's head and substituted thereon a truly protective safety helmet.

Today's fireman, educated to the hazards he encounters, no longer attempts to live up to the title "Smoke Eater"—he is protected by breathing apparatus and masks and special clothing, by emergency resuscitation equipment, and a host of other instruments and equipment. These, without exception, are the product of the professional engineer, applying the knowledge taught by experience and broadened by the sciences.

By the same token the professional engineer outlawed the canary from the coal mine and substituted accurate and reliable instruments which detect and warn of various gases and other dangers underground.

Most engineers are familiar with the fact that recent decades have brought a new profession into existence. At the turn of the century there was no such thing as a "safety engineer" in factory or mill or mine. And the whole complexity of problems which we classify today as human hazards were the shared responsibility—almost universally ignored or even unsuspected—of everybody in general and nobody in particular.

Times, fortunately for our people's lives and limbs, have changed for the better. Most progressive industrial and mine managements have safety engineers charged with the endless and complex responsibility of preventing accidents, reducing or eliminating hazardous conditions, and protecting human health. Similarly most of our federal bureaus and municipalities that deal with large numbers of people have learned to attack these problems with the same thoroughness.

In recent decades, we must remember, man also has made enormous strides of a technological nature, broadening our use of old materials and developing new materials, broadening our use of old forms of energy and developing new ones. A simple illustration is the countless new applications found by our engineers and scientists for the older metals, for electric power, for petroleum and natural gas—and the mushrooming applications for new metals, for new forms or sources of energy derived from what we loosely term "nuclear fission."

A concomitant of the birth of all these technological advances is the simultaneous birth of new hazards, new safety problems, new conditions that did not exist in grandfather's day. For example, farmers today use powerful new insecticides and pesticides, many of them organic phosphates and, therefore close chemical cousins of the war gases developed in World War II.

Properly handled these new agricultural aids do a better job, by far, than older pesticides—and help to produce better crops and livestock; but it was first necessary for the engineer to foresee and forewarn of their dangers, and to develop the means for using them safely. In my boyhood a farmer didn't know of the existence of such problems, or of respirators or special clothing to protect himself in using such new materials.

A variety of new gases, liquids and other materials exist today and must be coped with for safety's sake, although they were unknown forty years ago or even five. Our modern vehicular tunnels would be impractical were it not for carbon monoxide recorders that monitor the concentration of exhaust gases in the air and automatically control ventilation fans or interrupt traffic flow when the atmosphere in a tunnel becomes hazardous in the slightest degree.

Left: Shown are the carbon monoxide recorder panels that provide continuous monitoring of gas concentration in the Holland Tunnel, New York City. Right: Here a rescue team enters a mine wearing the Chemox oxygen breathing apparatus.

Because of the sensitivity and never-tiring watchfulness of modern safety devices and detection instruments, today's factory or mill or laboratory can safely handle combustible gases, such as the aromatic hydrocarbons, benzene or toluene, or other explosive or toxic materials, as raw materials for new products or as a by-product of manufacture or processing.

THESE, too, we can effectively control because the professional engineer has foreseen the problem, evaluated it, and by drawing upon the sciences at his command perfected our defenses. Picture, for a moment, how dangerous it would have been for our great-grandparents to attempt to use fluorination techniques or radioactive tracers in a day when there was no practical technology for working with such materials, or escaping their dangers!

Chemistry has perfected a whole new family of materials that make our clothing last longer, launder better, stay "new-looking"—that resist mildew and stain, abrasion and wear, acids and alkalies. Engineers have applied these materials in devising safer, stronger, longer-lasting work clothes, as well as using these special fabrics for protective coverings of pipe joints, valves and other key parts or objects.

The safety engineer in today's factory or mill or plant is constantly faced with problems that require the engineering approach. The modern industrial operation, however simple to the eye of the casual visitor, is in reality capable of producing thousands of hazards of either constant or occasional nature. As often as not an occupational hazard is hidden rather than obvious, and only the trained observer can quickly see it. Thus, the safety engineer is necessarily, first of all, an analyst with the engineering knowledge to understand a mechanical or chemical operation, a material handling technique, a storage arrangement, a traffic control procedure, or any one of a hundred-odd additional sources of potential human risk.

Again, he must be capable of analyzing the area of activity for possible hazards. Use of industrial trucks may, for example, contribute to safety in materials handling—reduce the "hernia potential" present in lifting and carrying materials or products by labor — but the safety gained could be nullified if movement of such trucks is not controlled to avoid collisions, injuries to pedestrian workers, or to machinery or building facilities. Only an engineer skilled in the various aspects of materials handling and plant traffic can properly assay the problem to maintain safety and work efficiency.

Another requisite is the ability to correlate operating procedures with safety standards, and to gain the cooperation of all executive and supervisory personnel in maintaining both work efficiency and safety. Appreciation of all the factors involved and skill in applying safety techniques that are effective and at the same time promote operating efficiency require the professional engineer's best efforts.

IN one instance the problem may require simply an improved system of identification for plant piping to avoid abuse or misuse of plant services or guard against accident. In another it may demand considerable knowledge of modern instrumentation for effective control of the flow—and safe utilization—of a variety of materials.

Implicit in this responsibility for over-all safety in the plant or factory is the need for adequate authority to apply safety measures wherever and whenever they are needed. The safety engineer with his technical skill and background is eminently qualified to assume and utilize such authority.

Understandably, industrial and mining managements have granted such authority more and more freely in recent years as qualified professional engineers assumed the duties of maintaining safety. This has been stimulated, too, by the fact that safety supervision has gained a more and more clearly defined entity in recent years; not so long ago the job of safety director in many plants or mines was ill-defined, rarely referred to in executive meetings, and as like as not was simply an "added-duty" assignment for a personnel executive or operating executive.

More recently, also, there has been a broadening of latitude for the safety executive. His word now carries substantial weight with the purchasing department—his knowledge of safety requirements is invaluable in selecting machinery, tools, clothing, instruments, equipment for plant fire and police departments, and many other purchases.

By the same token he knows or anticipates the effects on human welfare and efficiency when operating schedules are prepared, or procedures planned. Because of his engi-

neering knowledge he can frequently suggest a different way of doing a job to make it safer as well as more productive. If it's a question of a cleaning a tank car, for example, he may know a better, faster way to ventilate it to make it fume-free and safe for entry or repair.

It must not be assumed that every industrial or mining job today is entirely safe because engineers assigned to the job of safety director have been one hundred percent successful. Few if any jobs are perfectly safe; few if any safety directors claim accident-free records. But take a look at the record, as compiled by the National Safety Council, public agencies, and other reliable sources, and you will find that our professional engineers have made practically every human activity far safer than it ever could have been without the engineering approach to accident prevention and industrial health.

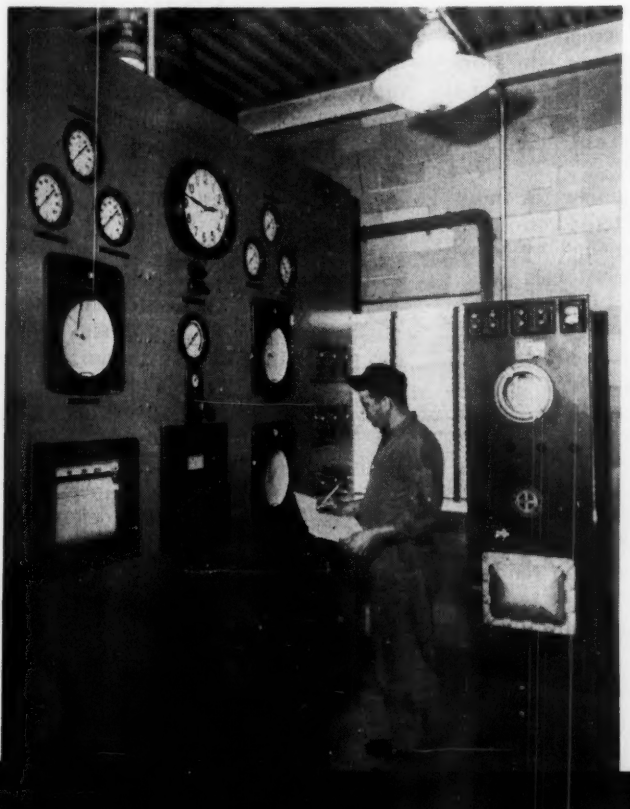
It should be noted that the records of any industrial firms prove accidents are enormously costly in dollars, in materials, in production time, as well as in human costs. Blake R. Van Leer, president of the Georgia Institute of Technology, noted in an address in 1950 that "for every dollar spent in producing our manufactured products, at least four cents are chargeable to the direct and indirect costs of accidents."

He added that "without safety engineers, especially in our larger plants, this figure would be at least two to three times as great."

It is encouraging to see there is growing recognition of the need for professional engineering supervision of safety programs. More and more engineering curricula in our colleges and universities include safety courses. And professional engineering groups are strongly advocating such training for safety executives. The Metropolitan (New York) Chapter of the American Society of Safety Engineers, in a recent survey of members, established the fact that many members are professional engineers, and many others are applying for professional engineers' licenses.

It might well be said that there are hundreds of thousands of men and women alive and well today who would not have been if engineers had failed to make their jobs safer as well as more productive. In our records at Mine Safety Appliances Company in Pittsburgh are the names of many men who have escaped serious injury or death because they were wearing modern protective safety hats—instead of paper-wadded derbies!—when struck by falling objects or swinging beams.

Process control board is shown (left) in the control room of Refinol, Inc. In the background is the MSA Combustible Gas Alarm which alternately samples and analyzes atmosphere from eight strategic locations to warn of combustible concentrations of propane-air mixtures.



There are many men and women who literally owe their lives to superhuman alarm systems, developed in our research laboratories, that warned in time of the presence of toxic gases or fumes that could not be detected by the human senses. There are many men and women who owe their health to the fact that respirators, masks and other equipment perfected by our engineers and technical staffs safeguarded their lungs and circulatory systems from seemingly innocent dusts and fumes and gases.

This happens to be the fourth of my company's first four decades. The Chairman of our Board of Directors, George H. Deike, and my father, the late John T. Ryan, established Mine Safety Appliances Company in 1914. They were two young professional engineers who left the United States Bureau of Mines to establish their safety equipment business because they saw a desperate need for a relentless attack on work hazards.

The hazards remain, but their work, and the work of the organization which they built, may well symbolize the successful campaign which they pioneered. The company's catalogs list upwards of 3,000 safety devices, instruments, and other products . . . an indication of the complexity of the safety problems that exist today, and of the means that have since been developed to meet them.

Most of the men and women at MSA's plants and laboratories and offices are engineer-trained, and thus engineers form the nucleus of our organization. Our field sales and service staffs are predominantly engineers in background, training and experience—and thus equipped to apply improved engineering knowledge to safety problems.

Both the so-called theoretical sciences and the applied science of engineering are represented in our laboratories in Pittsburgh, the largest in the world devoted to the development of safety equipment. It would be gross understatement to say that without the professional engineer, Mine Safety Appliances Company could not be what it is today—our business could not conceivably operate or serve as it does.—***End.***

About the Author . . .

Mr. Ryan

John T. Ryan, Jr., born in Pittsburgh on March 1, 1912, received his B.S. at Pennsylvania State College in 1934, and his M.B.A. at Harvard in 1936.

After completing his school work, he came to Mine Safety Appliances Company, as a sales engineer. In 1938 he was appointed assistant general manager and in 1940, general manager. He was elected to the board of directors and named executive vice president in 1948, and in 1953 was elected president of the company. He is also president of the Callery Chemical Company, a wholly owned subsidiary of Mine Safety Appliances Company.

Active in civic affairs, Mr. Ryan is president of the Pittsburgh Hospital Association, a director of Mercy Hospital, vice president and director of the Metropolitan Pittsburgh Educational Television Station, and vice president of the Hospital Council of Western Pennsylvania. He is also a director of the Tri-State Industrial Association and the Pittsburgh Symphony Society.

Dues Increase Brings New, Aggressive Programs

By T. CARR FORREST, JR.,
President, NSPE

As a member of the NSPE Board of Directors for the past seven years, serving for the past two years as chairman of its Budget Committee, as well as a member of its Executive Committee, I have had the unpleasant task at various times to remind the Board that some contemplated programs could not be fully implemented because of financial limitations. Now as President I am unfortunately faced with the same problems, but I am also considerably heartened by the prospects for the future. When the Board of Directors of NSPE decided to increase the dues effective January 1, 1954, it made possible the continued aggressive programs of the Society, as well as providing for better service to its membership and the engineering profession.

I am sure I need not reiterate the various factors which made it imperative that a dues adjustment be made if the Society was to continue to exert its leadership. All members, I know, are aware that the costs of all things for which the Society's money is used have increased considerably over the past several years. A portion of the dues increase, therefore, will be needed to maintain normal operations on a high level of service to the membership. In addition, of course, we have a much expanded program as well as an increased membership.

While the administration of the Society and its committees are diligently studying procedures by which the various programs will be implemented, it is too early as yet to be able to report the specific details or the budget allocations which will be possible. The Board, at its meeting in November, will give the final review to the plans being developed by the committee chairmen. I hope to be able in a later report to give the membership a breakdown of some of the major programs and their costs so that all will have a better picture of just how the dues dollar will be spent.

There are, of course, certain programs which definitely will be developed and implemented in 1954. One of the major projects in which our entire membership is interested is the continuation of our public relations activities. These activities not only will be continued, but it is hoped that the program will be expanded to cover some of the objectives which it has been impossible to attain in the past. On the broad front of information to the public, the principal effort will be concentrated, as in the past, on National Engineers' Week. However, it is hoped that a year-round program of newsworthy information can be developed on the basis of national releases for public consumption and information supplied to state societies and chapters through which they, too, can develop stories of interest on the local level.

A major emphasis, of course, will be placed on a continuation of the Executive Research Survey series of the Professional Engineers Conference Board for Industry.

It is hoped, too, that our public relations activity can be expanded to be of more general assistance to states and chapters through the development of such things as assistance with respect to chapter programs, timely reports on activities which will be helpful to chapter and state public relations planning, and more extensive reporting to the membership on all activities of the Society.

While we have had excellent government liaison in the past, there have been many fields in which it has been impossible for us to carry the contacts desirable. With the general expansion of the Society's programs, it is expected that we may improve this phase of our national activity.

Our committees in a number of other fields are actively studying surveys and reports which will be of assistance to state societies as well as other units of the engineering profession. For example, in the educational field more extensive cooperation with our nation's educators, surveys of some of the professional aspects of engineering education, and other similar matters are being considered.

In the field of engineers in industry, a recently-appointed committee is studying ways and means by which the professional society can be of some assistance to this large group of our profession.

Another committee, concerned primarily with the engineers between college graduation and the attainment of full professional status, is investigating ways and means of attaining closer coordination of this group with the professional society as well as improving the service which the professional society can render to it.

The big question of collective bargaining is the subject of extensive study by several of our committees, and it is confidently expected that the 1954 program will include a large degree of activity in this field.

NSPE's growth over the past few years has been most encouraging. However, I am sure that for many of us there has been a desire that the growth be even greater. It is somewhat disheartening to me as I get about the country to find that there are many professional engineers who do not know of NSPE as well as many who do know of it but have quite an erroneous impression of its objectives and its programs. This, of course, can be corrected only through an aggressive membership campaign and the development of materials to assist our state societies and local chapters in acquainting non-members with the programs and activities of the Society.

A third Board Meeting which has not been possible in the past is contemplated for 1954—a Spring Meeting in Albuquerque, New Mexico. In addition, of course, there also will be the Annual Meeting in June in Milwaukee, Wisconsin, and the Fall Meeting in Omaha, Nebraska.

Of course, one of our most pressing problems is that all of these expanded activities cannot be carried with our limited headquarters facilities and staff. Your administration, therefore, is now concerned with providing more adequate headquarters facilities. A proposal in this direction will be considered by the Board of Directors at the Fall Meeting.

In addition, the Society has not been able in the past with its limited finances to accumulate the substantial reserve which a good business should have. Thus, it is hoped that out of the 1954 budget there can be provided an annual increment to a reserve which, in time, will build up a satisfactory financial backlog.

In our democratic form of Society administration, there are many steps in the planning of a program. While programs originate in broad form in a committee or from the membership itself, funds must be provided under the budget, and the whole program approved by the Board. It is only then that a committee can begin to work on specific plans. But I am determined as the year progresses to keep the membership as fully informed as possible regarding the various phases of each program.

An *American Engineer* SPECIAL REPORT

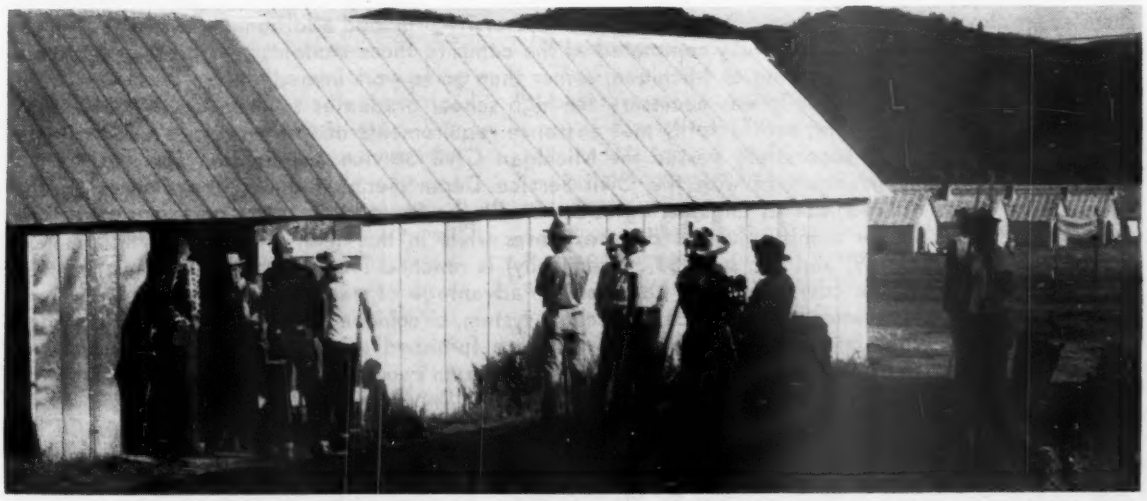
Re: Michigan's Answer To Its Civil Engineer Shortage

● A remarkable new program carried on through the cooperative efforts of the Michigan Road Builders Association, the Michigan Highway Department, and the University of Michigan is the basis of this American Engineer Special Report. The facts were supplied by C. J. Carroll who is the executive secretary of the Michigan Roadbuilders Association and an NSPE member.

Because of his position with the Roadbuilders, Mr. Carroll has been particularly sensitive to and concerned with the need for keeping a steady flow of young engineering talent into the civil engineering field. It represents a very serious problem to him and to others like George M. Foster, chief deputy commissioner of the Michigan Highway Department and chairman of the Manpower Committee of the Michigan Engineering Society, when they learn that during a representative school year at the University of Michigan, for example, only 238 of 1,812 undergraduates in the Engineering School are studying civil engineering. And this was exactly the case in 1951-52, the year before the new program was initiated.

THEY MADE THE PROGRAM WORK. Left to right: George M. Foster, Chief Deputy Commissioner, Michigan Highway Department; Earnest Boyce, Chairman of Department of Civil Engineering, University of Michigan; C. J. Carroll, Executive Secretary, Michigan Road Builders Association.

Sketching the background of the situation, Mr. Carroll writes that: "For several years, particularly since the close of World War II, contractors, municipalities, and highway groups across the nation have been crying the serious shortage of civil engineers and trained engineers' aides. They blame the shortage on everything from the war to the fact that today's youth are finding more romance and adventure in science and other forms of engineering, or are being wooed into other fields by more attractive salaries." The decline in the number of students studying civil engineering actually started before World War II, Mr. Carroll asserts; yet it has taken the postwar acceleration in street and highway con-



The day started early for Camp Davis students. The small buildings at the right are student living quarters.

(*Please turn the page*)

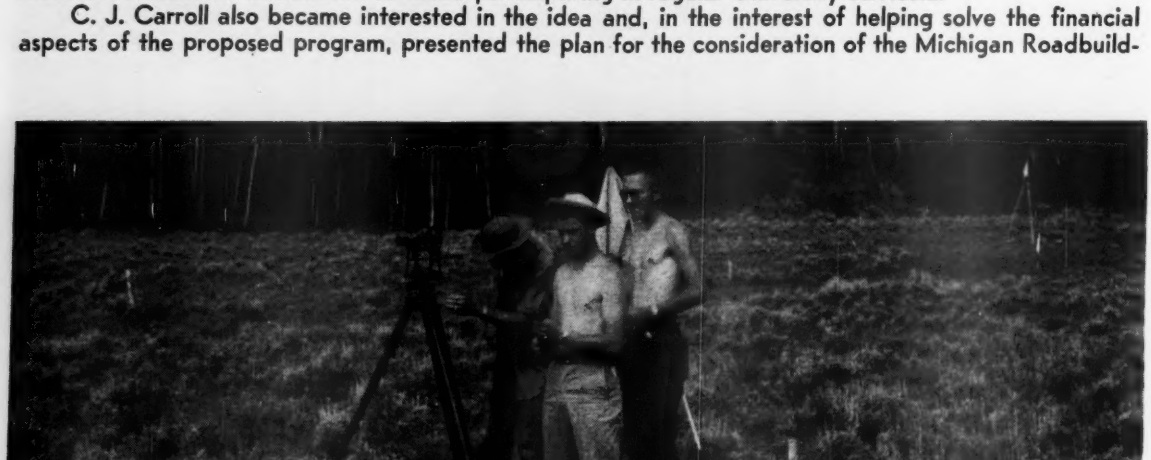
struction, industrial expansion, and internal improvement planning to spotlight the gravity of the problem. All of these activities require civil engineers in large numbers, and Michigan has been particularly hard hit even though its civil service pay rate for civil engineers and engineering aides ranks among the top ten states in the country.

Actually one program was already in force in the state to meet the shortage of trained civil engineering personnel. Since 1949 it has been possible for college students to qualify for summer employment by passing the Civil Service examination for Engineering Aides B, but this program, despite its many advantages, has not been providing sufficient personnel to meet the full demand.

It was felt, therefore, that a supplement was needed—a program that would capture the interest of young men in civil engineering and highway work even before they started college. In the fall of 1952, Deputy Commissioner Foster, who is another NSPE member, contacted Earnest Boyce, chairman of the Department of Civil Engineering at the University, to ask what the school could do to help work out the problem. The two agreed that a well-rounded summer program to introduce qualified high school graduates to this type of work and to give them a taste of it in practice as well as in theory would be a most effective way of meeting the situation.

For several years the University has maintained summer school facilities at Camp Davis, a 120-acre tract, surrounded by mountains, 14 miles from Jackson, Wyoming; and for the two preceding years the facilities had been used for summer engineering courses. It was estimated that the camp could accommodate 30 students in addition to those participating in regular University curricula.

C. J. Carroll also became interested in the idea and, in the interest of helping solve the financial aspects of the proposed program, presented the plan for the consideration of the Michigan Roadbuild-



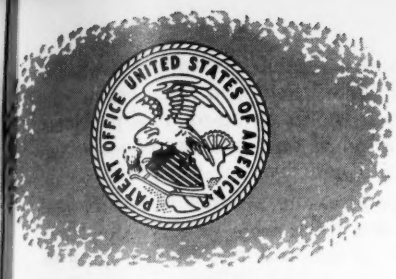
ers Association. The group agreed to underwrite approximately 50 per cent of the program's cost, appropriating $100 per student and depositing the amount with the University's Summer Surveying School Fund.

Professor Donald Cortright of the University's Civil Engineering Department was appointed to serve as coordinator in working out a worthwhile program with Foster and Carroll. An eight-week course was set up designed to give the students all the civil engineering background that they would get during their first year of a regular college course, plus vocational training that would be of benefit to them as employees of the Highway Department. The University provided additional incentive by agreeing to give credit for work successfully completed at the camp to those students who preferred to continue the study of civil engineering at Michigan, rather than go to work immediately.

To qualify for the course, it was necessary for high school graduates to have completed a high school course in trigonometry, satisfactorily met entrance requirements of the University's Department of Civil Engineering, and successfully passed the Michigan Civil Service examination for Engineering Aides B. By special arrangement with the Civil Service Department, students who completed the course were to be offered jobs as Engineering Aides B with the State Highway Department at a starting salary of $253.56 per month, plus per diem expenses while in the field. The normal initial salary in this position is $231.29, and top pay ($3,296 annually) is reached in six step raises. Thus, the students who completed the course were to be given the advantage of starting at the second step.

Through the cooperation of the Michigan school system, circulars and pamphlets were distributed to all high schools in the state, and application blanks were furnished as requested. The 30 graduates ultimately selected to attend the camp represented 22 Michigan counties, with the majority of the boys coming from smaller communities.

Only one of the entire group decided that engineering was not his field and dropped out. Of the balance, 16 went to work for the State Highway Department upon completion of the course; seven of them accepting employment on a temporary basis with the aim of attending college to take a complete civil engineering course in the near future. The remaining thirteen, plus one of the seven temporary Highway employees, entered various colleges this fall to continue their engineering studies, with eight definitely signing up for civil engineering courses.



PATENT FUNDAMENTALS FOR ENGINEERS

BY HENRY K. LEONARD, *Patent Attorney,*
Law Offices, Owen and Owen, Toledo, O.

—Part II of III Parts—

In order to be the inventor, the man who gets the patent, you have to be the man who has really done the important thing. For example, I may say to you, "Let's build a rocket to fly to the moon." That's a lovely idea, but that's all it is. It's just an idea; we haven't accomplished anything. We haven't taught the world anything; we have not promoted the progress of science or the useful arts. But suppose someone provided with the idea, sits down and designs a rocket which will fly to the moon. Assume that scientific knowledge is such that we would know that a rocket of this design will fly to the moon. Now you can go ahead. Once you've gotten that far, you've made an invention because you have contributed to the progress of the arts.

We patent lawyers call the next step which must be taken a "reduction to practice." You can reduce to practice in either one of two ways. You can actually build the rocket, and prove that it works, or if it's a device that will obviously work as soon as it's designed, you don't have to prove that it works. If you've proved that it works, that's an actual reduction to practice. Or you may make a constructive reduction to practice which consists in preparing and filing a patent application.

You conceived this invention. The conception of the invention was the step which *you* took after I said, "Let's build a rocket to fly to the moon." I didn't conceive anything but an idea, and you can't patent an idea. So if two engineers are working together in a factory, as they so many times do, or in a laboratory or anywhere else, and one of them has a hot idea—"Let's do so and so," it may be that the mere realization of the idea is enough to enable anyone to build a device to do it. In that case the man who had the idea is the inventor, because by the mere idea he has worked it out. Anyone can then take it; a mythical man in the art, again, can then take the idea and then turn it into a working device. If that's true, the man with the idea is the inventor. But if the idea is merely that, and it doesn't convey any means of carrying out the idea, then the man who develops the operative means to carry it out is the inventor. Now there is some importance as to who is the real inventor, because if the wrong man is named as the inventor in the patent application, and if, for example, someone else can prove it, the patent is on the face invalid. So you've wasted all your effort in getting the patent. The patent lawyer sometimes is accused of being too suspicious by engineers when he gets very inquisitive about who did the actual inventing. But you can see why this is important.

I mentioned the word "conception." Conception of an invention includes more than your mental idea of how this problem is going to be solved. Incidentally, that must be a complete operative idea. You can't have a conception if your machine requires a lever or an arm, we will say, which will reach over and perform a mechanical action one time each second unless you have in your mind a complete idea of the mechanism which is going to make an arm do that; or unless arms that perform that action once every second are so common in mechanics that, when you have thought of a one-second operation performed by that arm, you have automatically thought of a half dozen ways of doing it. Only then need you not work out the complete operative concept of how the arm will work. But assume for the moment that this problem is not one where the operation of this arm and its duty is just routine and anybody could design it. Assume that it's not that easy. So then in order to conceive an invention you have to have the entire operative invention in mind. But what you have in mind no one knows and you can't prove it. The Court doesn't allow you to prove by your own statement that two years ago you had in mind such and such a structure, because the Court and all of us are human. We know that what we had in mind two years ago is impossible to distinguish today from what has gotten into our minds in the meantime and from what we wish we had had in mind two years ago. No one accuses anybody of stealing, but the law just says flatly that's no good; you've got to have corroboration. Now I'm emphasizing a most important point in invention from the standpoint of all working engineers. Everything that you invent must be corroborated. Corroboration means there must be some other party, some other person who can testify that: "Yes, on March 2, 1951, John Jones told me so and so." Preferably he should also be able to say, "And there is the drawing that he showed me that day, and that's my signature. I put that date on there, and I understood what that drawing was on March 2, 1951; and, furthermore, this is what it was." Now if you've got that kind of a witness, you're in very fine condition. So your witness, your corroborator, the person to whom you disclose your invention, should be well trained enough to know and to understand what you're telling him. You should have him witness your sketch, your description, or whatever it is, and date it, so that later on, for a most important reason, he can testify what you did on that day. Your word alone is not enough.

Similarly, where two men are co-inventors, or three or four, or any other number who invent together and who are entitled to have a patent in their joint names, none of them can corroborate any of the others. There still must be an outside corroborator, a person to whom the invention was disclosed. As soon as the conception has occurred, you must disclose it because you need to prove that you've disclosed it, and that's the only way you can prove it.

Then you must proceed actively toward the reduction to practice of your invention either by an actual reduction or by a constructive reduction, the filing of a patent application. That period is called a period of diligence. Diligence in the law means that you are actually working toward it —the perfection of your invention. You haven't set it aside on a shelf in the basement and forgotten all about it for nine months, or two years, or maybe as short a time as six weeks. Until Bill Smith comes out with it you do nothing. But when he does, you say, "Holy smokes, I thought of that nine months ago." Then you go down, you dust it all off carefully, get back to work furiously, and file your patent application because Bill Smith has proved its importance. You thought of it nine months ago, and you want to get in there fast and get a patent, because it's going to be an important invention, and you'd rather have the patent than have Bill Smith have it. That's no good, because you haven't been diligent. You've been stirred into activity by the other fellow, the fellow who

invented it, who went ahead and made it and promoted the progress of science. When you stuck yours in the basement, you didn't promote the progress of science, or the useful arts. You made an abandoned experiment.

However, if you went ahead in the first place and actually reduced it to practice, if you completed the invention and made an operative device, then your period of diligence has passed; and you no longer have to be diligent because there you have completed the invention. You have conceived it, you have been diligent, and you have reduced it to practice. And that's what the law requires you to do in order to complete an invention.

But you still may be in a little bit of trouble, if you haven't gone any further than that. Bill Smith came along later, and maybe you didn't even know about each other, but he invented exactly the same thing—or a variation of it which is substantially the same—and he went ahead and filed a patent application.

In an attempt to discover who the first inventor is, where two or more people have separately invented the same thing, the Patent Office has what is called an interference. That is like a court trial. It takes place in the Patent Office itself, but it is a trial where the two inventors produce their evidence to prove when each of them created his invention, and each one tries to prove that he was the first to conceive the invention, that he was diligent during the period of required diligence, that he first reduced the invention to actual practice, or that he went ahead and filed his patent application. If your filing date, i.e., the date of your application, is earlier than the other fellow's, you have an enormous advantage.

In the law in every legal action, we have what is called the "burden of proof." We can't have these two people arguing at the same time. In order for a legal action to go ahead, somebody has to carry the ball. Somebody has to talk first. In the law we say he has the burden of proof. In a patent interference, the burden of proof lies on the man who filed the later application. So if you're the first applicant you just sit back and relax while the other fellow tries to prove that he invented before you did, and unless he proves that he invented it before you did, you don't have to do a thing. And his proving that he invented it before you did becomes more and more difficult as time goes by. So say that your application was filed long ahead of his, perhaps two years. He'll have to have the most nearly ironclad, the most nearly perfect proof in order to get back of you. It's just too long a period of time. It's almost impossible to fill in that two year gap with enough proof, enough work, enough diligence, to enable the later man to carry his inventive date back earlier than the day on which you filed your application. So you gain a tremendous advantage if you are the first to file your patent application. It's not a guarantee that you'll get the patent, but it is an advantage. In interferences the patent goes to the first man to file the application over 75% of the time. So you see you have a 3 to 1 advantage immediately.

THE frequence of interferences sometimes baffles people who aren't active in patent law. It doesn't seem possible that as many separate sets of inventors would simultaneously invent the same thing. But, strangely enough, that's one of the facts of life. As soon as an inventor hears that Bill Smith somewhere else is trying to get a patent on his same invention, the first thing that occurs to his mind 99 times out of a hundred is "How did that guy find out what I was doing? He stole my idea." Or "Say, do you remember when Tom Brown was here, and he could peek out into the laboratory? I'll bet he saw my invention and went right back to the company laboratory and had it done." Well, once in a long time that's true, but frequently, most frequently, it just seems to be a rule of human endeavor that as progress takes place in any field and men working in that field become aware of what's going on, new problems come up and what the mind of one man can conceive the mind of another man can conceive.

Along the path of progress it became necessary and possible, for example, that there be a new type of lamp. So Edison invented one in this country. But so, quite interestingly enough, did Sir Joseph Wilson Swan, whose name may not mean a thing to you—it meant nothing to me. At that time, however, he was England's most famous electrician and physicist and he invented the incandescent lamp and, in fact, he thought of tungsten for the filament before Edison did. He built a much better incandescent lamp than Edison did. But Edison did it just a little bit sooner, just a little bit, and he got his patent in the United States. Swan was a Britisher, and our patent laws, like anyone else's patent laws, give the local fellow kind of a boost along the way in the hope that he'll get the patent instead of the foreigner.

Here's another interesting case. We all know Alexander Graham Bell's name—he's famous—he invented the telephone. It took a series of cases so complicated that the discussion and decisions occupy a whole volume of over 600 printed pages to prove that Alexander Graham Bell did invent the telephone and not Mr. Gray. Gray's name may not stick in your memory at all, but there was a Gray Telephone Company once and Gray got to the Patent Office with his patent application just a few hours later than Bell did. If Gray had gotten there that much earlier, it might be the American Gray Telephone Company—not the Bell Telephone Company at all. Neither Gray nor Bell knew a thing about what the other man was doing, and there is no question but what Bell was just a little bit ahead.

So you can see how terribly important your records are. We can't over-emphasize the importance to you of records which you keep of your work. They should be complete; they should tell the whole story or they should tell enough of the story so that anyone else in your field can get the whole story. We recommend that you keep a day book, an experiment book, and that you keep it religiously. If you're working in a field where you're likely to want to get patents on your work, keep a day book. Record in it every day the new ideas, the tests, the developments, the concepts that you've made, and get it signed and witnessed by at least one individual who can explain it years later. Years later you may not even remember what it says but if he can pick up your notebook and have it refresh his recollection (it is perfectly proper for him to do this and of course perfectly admissible testimony), if he can use that notebook and his signature on it and, if he can honestly say, "I signed Tom Brown's notebook. I signed it all the time. It was a standard procedure for him to come in every afternoon and say 'Hey, Bill, look what I did today, . . . Will you witness it?', and I witnessed it,"—it removes all doubts as to whether or not this might be a bit of faked evidence.

Without such rigid requirements for proof, the most beautiful looking things you ever saw in your life are introduced as authentic documents that prove the conception of an invention. And after study by "questioned document" examiners, by attorneys on cross-examination, they are revealed to be total frauds. But if you can have your witness say that as a regular thing you wrote this book up every day and he witnessed it, and if he can say that he remembers, it is perfect, absolutely perfect, and not open to challenge at all.

That type of evidence can't be beaten. I frankly say that in the interferences in which I have been involved (something over 25 or 30 in the course of the last twelve years)

only once did we have good evidence. And every other time we were relying on scraps of paper, on little notes over in the corner, where the inventor had happened to jot down the date, or on the back. The blueprint girl had a record that she made a blueprint of a drawing on such and such a date and that this drawing had been in her files ever since, for example. No one had taken it out. Incidentally, you will be amused to know that, in two of the interferences, patent attorneys were the inventors, and even they hadn't kept good records. It's awfully discouraging; they ought to have known better.

That, very briefly, is how you get up to the point of a patent application and the reasons why you have to do what you have to. I'd like to outline for you what the patent is, what its parts are, and the importance they play in this picture. I think we'll get down now to some questions which I earnestly recommend that you, as practicing engineers, should study most carefully. The most common type of patent is the "utility" or, frequently called "mechanical" patent. There are several parts of it about which I am going to tell you. The first one on the front is the drawing. The drawings are a most essential part of any patent application on a machine. They are absolutely essential on a machine, because it is impossible to describe a machine and all its operations unless you have drawings of an operative machine. Now you may draw them schematically, unless your invention is in a particularly detailed structure, but it is best to have a completely operative machine shown in the drawing. The second part of the patent is what we call the specification. The specification is a description of how the machine works. In order to promote the arts and sciences, you have to tell how to carry out your invention; so this part of the patent tells how to do it. The specification, of course, also includes the description of a great many things in addition to what you've actually invented. Nowadays with science as full as it is, most of our inventions consist of improvements on prior things. So in the specification we frequently describe the prior art, machines or processes, and then fit our improvement into them to explain how our improvement makes them operate better, or changes the operation, or whatever the case may be. That is the specification.

THEN there are the claims. The claims are the most difficult part of the patent both for the engineer and for the patent atttorney, and they are probably the most important part of the patent. They are the statement of the invention, what is claimed as the new invention. In that sense, they are identical with what we all know as land claims. You will recall from the stories of the West that when a miner found gold at the place marked "X", (*See Figure One*) he filed a land claim with the Claim Office, and he said, "I claim the land in the area bounded by a line between the oak tree going 150 feet east, to a stake which I buried in the ground, going south for 200 feet to a big boulder in which I have cut a notch, and then west for 175 feet to the shore of a little creek which runs along there, then back down to the oak tree."

Now the gold miner found gold right at the X; but he wanted to claim as big a piece of land around his gold as he possibly could because maybe the gold vein went out like the arrow 1, and maybe it went up like the arrow 2. He didn't know. The law gave him a certain maximum claim that he could file. Because one man found gold in the middle of Lucas County, he wasn't going to be allowed to put in a claim for the whole area of Lucas County. That was a little bit too large. So the government had some arbitrary rules as to how big an area he could claim, and so he filed his claim.

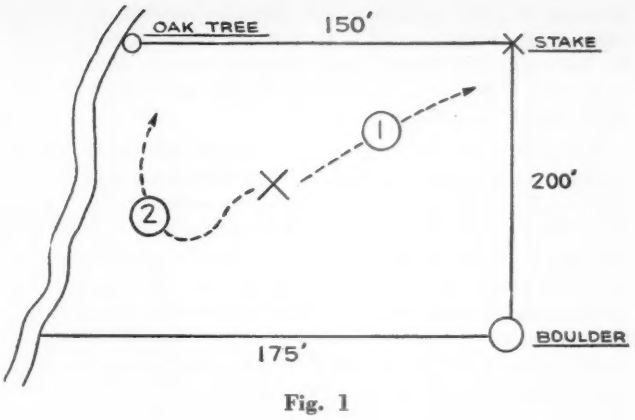


Fig. 1

That is just like a patent. You've made an invention, which is right at X. (*Figure Two.*) This is what we call the particular embodiment of the invention which you have made, the particular way you do it. But there are probably a lot of other ways of doing it. You may have driven this machine with a set of V-belt and pulleys, and that may be an essential part of your invention, to drive it under a certain type of control. But it may be just as easy to drive it with gears, or it may be just as easy to drive it some other way. You shouldn't be limited in your

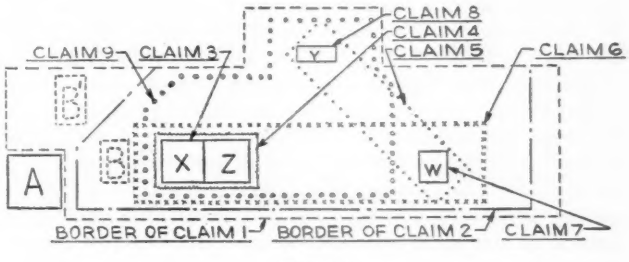


Fig. 2

invention to any particular way, and your claims should include what we call equivalent, or alternative ways of doing the same thing. You can't patent an idea, but you can patent a structure, and you're entitled to cover with your claims all ways of doing that same thing which haven't been done by somebody else. So you like to make your claim as big as you can with respect to your invention.

Part of your patent attorney's job, one of his biggest jobs, is to take the embodiment of your invention that you tell him about and think of a couple of other ways to do exactly the same thing. One of them may be at W, and one of them may be at Y, and one of them may be right next door at Z. Well if he drew a claim which was just exactly the size of your embodiment, the claim would be only as big as the solid line, and anybody who did it like W or Y or even Z wouldn't infringe your claim. So your patent attorney either thinks of these other ways of doing it, or if he can't think of them, he asks you if there are any others. You should have tried to think of them, too. Then he writes claim 1, erects a word fence, as it were, around just as big a piece of territory as he can possibly conceive. The only thing he has to watch out for is that he can't include inside your fence, any old structure—for example, at A—because if this device A is old, you can't cover it in your claim, or if you do, your claim is invalid. So he tries to draw his fence—to write your claim—so that it runs right up to the edge of the old thing and right along that edge, and so that it excludes only that known to be old. He doesn't just erect one fence

because he may not know that there is another old thing right at B or at B', and if he doesn't know about it, and he has only one fence, and someone comes along later and says, "Oh, we were doing B out in Columbus five years ago," the claim is invalid.

You just can't let your patent rest on one claim which may be invalidated. So the attorney draws another claim, number 2, inside of claim 1, of a little smaller scope, taking in a little less territory. It describes a slightly more detailed structure. He includes a few more details of your invention in claim 2 and reduces the area. Then he draws some more, smaller and smaller, and if he does a good job he probably draws claim 3 just the size of X, and he draws claim 4 that includes X and Z because they probably have many things in common. If he can, he writes claim 5 to include Y and W but not X and Z and other claims as shown. He covers it in every direction he can, erecting just as many fences as he can possibly throw around your invention to make it just as hard as he possibly can for the next fellow to get at your invention by tearing down the fences or having your claims invalidated.

THE difference between the claims is the difference in the scope of the claims; and that difference is set forth, for example, in a mechanical case, by including additional structural elements of your invention or by describing the elements of your invention in broader or narrower language. The more that is included in the claim, the narrower that claim is. The more words there are in it, usually, the narrower it is, because the additional words usually list more parts of your invention, and the only thing that infringes a claim is a structure which includes every thing in that claim. You can describe the parts of your invention in broad language. For example, you might call them means for doing so and so. This is perfectly proper in a claim. You can perform the operation with a lever; so instead of naming a lever, you call it means for raising, or means for displacing, or means for shifting; and then it covers not only a lever, but also a screw, a rope and pulley or any other means for doing what the claim says. On the other hand, if you describe every nut and bolt in your device, then you leave the claim wide open. Anyone can escape infringement. He leaves out of his device just one of those little elements which you described in your claim and he no longer infringes your claim.

Perhaps this story will illustrate just how those claims work. We are all familiar with the old fashioned paper clip; it looks like *Figure Three*. It is a wire twisted upon itself, back and forth, so that when the wire is spread out it will slide over several pieces of paper and hold them together. Let us assume that John Jones invented the paper clip, and that's the one he shows in his patent drawing. He describes it and he tells the reasons why it's good, and then he claims it. He claims it by saying:

> "A device for temporarily attaching pieces of paper one to the other, which consists of—or comprises,"

(The meaning of those words is simple—consisting of—all the details; comprising—some of the details. "Comprising" in patent language has come to mean "including.")

> "which includes a flexible element having at least two generally opposed portions, and a connecting portion connecting the two opposed portions at one end thereof."

There is a paper clip, quite a few words, but it hasn't said very much and it is not at all limited. It describes a paper clip.

John Jones' attorney doesn't write a broad claim but only a specific claim—it might read like this:

> "A device for attaching two pieces of paper to each other, consisting of a straight length of flexible metal wire, a second length of said wire parallel to and spaced from the first said length of wire, a curved portion of wire joining the ends of said straight lengths of wire, a third straight length of wire parallel to and on the side of said first length of wire opposite from said second length of wire, a second curved portion joining the end of said second length remote from said first curved portion to said third straight section, a fourth straight section of wire parallel to all of said straight sections and located adjacent said second section and on the side thereof opposite said first and third straight sections, and a third curved portion connecting the ends of said third and fourth straight sections at the end thereof closer to said first curved portion, all of said sections and said portions lying normally in the same plane, said first and second sections and said second portion forming one arm and said third and fourth sections and said third portion forming another arm, the arms thus formed being angularly separable in a direction generally normal to their plane by torsional flexure of said second curved portion to separate such arms for the reception of sheets of paper there between."

Fig. 3

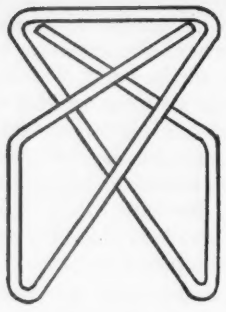


Fig. 4

Fig. 5

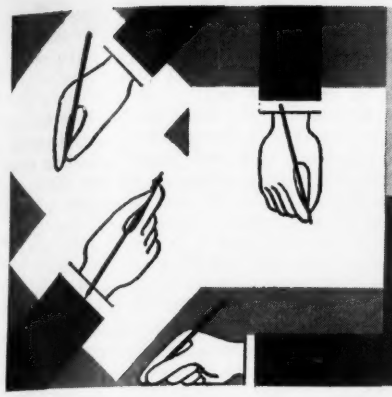
That is a description of the paper clip, too. But, as a claim it is not much use to Johnny Jones because if you come along and invent one that looks like *Figure Four*, you obviously don't infringe the last claim on the paper clip although you would infringe the first one. Or if you make a paper clip like *Figure Five*, again you don't infringe the long, long claim, but you do infringe the first one.

(The *American Engineer* is pleased to present this three-part article by the well-known patent attorney, Mr. Henry K. Leonard. The final installment in the series will appear next month.—*Editor.*)

About the Author . . .

Mr. Leonard

Henry K. Leonard, a patent law expert, has been associated with the Toledo, O., law firm of Owen & Owen since 1950. He began his career in the field of office management after graduation from the University of Wisconsin with a business administration degree in 1937. In 1941, he joined the staff of the Toledo patent law firm of Marshall & Marshall and simultaneously enrolled in the University of Toledo College of Law. His legal studies were interrupted by Navy service during World War II; but, in 1948, he received his degree *magna cum laude* and was also admitted to the Ohio bar.



Professional POSTSCRIPTS

Americans love surveys and engineers especially love *salary* surveys. Edgar A. Harty, P.E., of the Mass. SPE is no exception and below we print what he calls a "short article on a very timely subject." All right, Engineer Harty, the pages are yours!

—PP—

Many engineers have asked themselves the following questions:

How am I doing economically?

Is my salary adequate?

Why is there a shortage of engineers?

Let us look at some facts and study these with the eyes of an engineer.

According to the latest statistics, as published in the magazine "Challenge" of New York University, incomes of U. S. families in 1952, were distributed as follows:

13 per cent	less than $1,000
15 per cent	$1,000 to $1,999
18 per cent	$2,000 to $2,999
18 per cent	$3,000 to $3,999
15 per cent	$4,000 to $4,999
14 per cent	$5,000 to $7,499
7 per cent	$111 and up

If an engineer makes more than $5,000 per year, he is grouped with 21 per cent of the U. S. families and receives more money than the other 79 per cent. If he makes $7,500 or over, he is better off than 93 per cent of the family wage earners.

In an effort to obtain data on engineering salaries, two surveys were made by the Bureau of Labor Statistics in the middle thirties and the Engineers Joint Council, the National Society of Professional Engineers and the BLS in 1946. Up to date surveys are only available through private engineering groups.

A cross plot of all available data for Median Annual Incomes against the age of the engineer and from 1928 to 1952 is shown on *Figure 1*. A close examination shows that salaries decreased quite rapidly during the depression years, reached a low point in 1934, then started to increase again. Around 1941 all losses were recovered and salaries were steadily increasing. Unfortunately, due to the war and inflation, the value of the dollar started to decline. This is shown in the following table:

1939	100 cents
1942	85 cents
1946	71 cents
1951-52	52 cents

In view of this, the actual engineering salaries based on parity dollars are much less than those shown on *Figure 1* from 1940 and on. Currently a $5,000 salary is only $2,600 based on 1930 dollars. *Figure 2* shows the actual salaries based on parity dollars from 1939 to date.

It looks as if financially, as a profession, engineers have only gained the losses caused by the depression and no more. The older men have lost some ground and the heavier taxes contribute to a further reduction in real wages.

Flooding the market with more engineers will mean eventually lower pay for all. A better approach would be to utilize engineers more effectively as recommended by NSPE.

It seems to us that if engineers are responsible to a very large degree for "our way of life" they should also receive a larger proportion of the material goods which they help develop and produce.

The data shows that we are losing ground! What are we going to do about it? This is a challenge that deserves considerable study and a good subject to discuss at chapter levels.

—PP—

Now, we are proud to present a most interesting piece by Mr. R. L. Murray, President, the Hooker Electrochemical Company, Niagara Falls, N. Y. This article by Mr. Hooker is adapted from a speech he gave before the American Institute of Chemists on the occasion of his receiving an Honorary Membership in the organization. It is entitled "The Development of Young Men for Positions of Greater Responsibility." Don't miss reading it now.

—PP—

. . . Three years ago I wrote a short article on "Executive Training and Development" which appeared in the Institute of Chemical Engineers' "Chemical Engineering Progress" (March 1950). Within the past few days, I have re-read what I wrote then and I have also read many fine articles on this general subject. In addition, I myself have had three more years of working at it, and yet I find that I really cannot change what I said three years ago very much, if at all.

In my opinion, the training and developmen of young men so that they can be better prepared to take on more responsibility is one of the most important phases in the chemical industry today and, if anything, is more important than at any time in the past due to the tremendous expansion of our industry and resulting shortages of manpower. The widespread adoption of retirement plans, usually including compulsory retirement at age 65, has made more room at or near the top for younger men in many, many organizations, and this has greatly emphasized the necessity for training plans which will fit these younger men for the more responsible positions they will be holding sooner than they think.

The development of a strong second team which is trained to take over top responsibility five, ten and fifteen years hence is a major concern in all wide-awake and up-and-coming companies. As a matter of fact, there never seems to be an oversupply of young or middle-aged men who have clearly proved that they are capable of taking on top responsibility.

The first step in the selection, training and development of the young men who will be taking over top positions in the future is the appraisal and selection of new employees. The calibre of the men who will be running the company in the years ahead depends to a considerable extent, but by no means entirely, on the skillful selection and hiring of young men of latent ability. This is not an easy task with the present technical manpower shortage.

It is important that these new men be assigned to jobs for which they are at least reasonably well fitted, and books have been written to suggest how this can best be done. Personally, I do not care too much about what the new man first goes to work at. If he is willing to work hard, if he has initiative and some imagination, and if he has the knack of getting along well with his fellow workers, his head will begin to stick up a little above the pack. His special aptitudes will become more clearly evident to his supervisor and he will become eligible for special assignments where he will become more useful. Here is one of the first places where management must not fall down, namely detecting and recognizing above average ability. At about this stage, a rating of the employee by his immediate supervisors should be helpful and is being done more and more in progressive companies. Full benefits to the employee from such a rating can never be achieved unless the rating is tactfully but frankly discussed with the man involved. I have frequently seen great benefits resulting from such discussions and, in my opinion, management is falling down on one of its most important responsibilities if it fails to follow up personnel ratings with friendly and helpful discussions with the men being rated.

Much could be said about these employee ratings. Some rating forms are excellent, others are mediocre or poor. We have tried many before adopting the one we are now using and it is far from perfect. Obviously, certain characteristics are more important than others. Initiative, imagination, cooperation with others, willingness to work hard, common sense and judgment, all are important of course.

I know of no better advice to a young

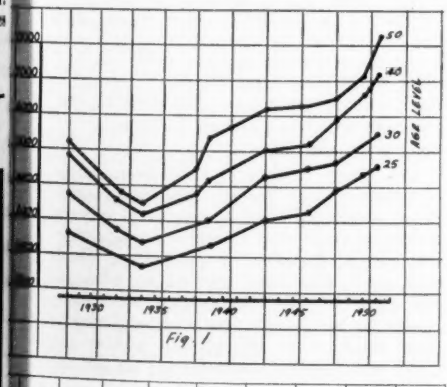


Fig. 1

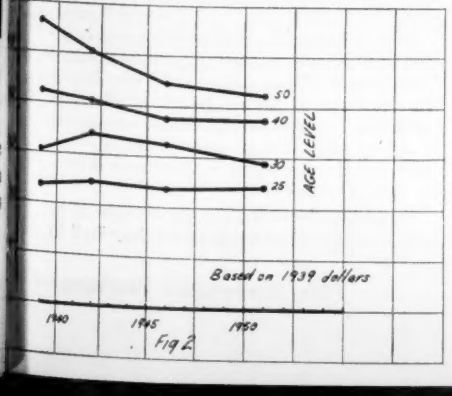


Fig. 2

NSPE Committee Heads

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Chapter Activities Committee—Oliver Deatsch, P.E., Rt. 6, Box 1436, Modesto, Calif.

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Education Committee—Willis R. Woolrich, P.E., College of Engineering, University Station, Austin, Texas.

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Foundation Funds Committee—Dean N. W. Dougherty, P.E., University of Tennessee, Knoxville, Tenn.

Interprofessional Relations Committee—M. Frank Wooten, Jr., P.E., 215 Latta Arcade, Charlotte, N. C.

Inter-Society Relations Committee—Dean Curtis Wilson, P.E., Missouri School of Mines, Rolla, Mo.

Legislative Committee—Dan H. Pletta, P.E., Box 366, Blacksburg, Va.

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Salary and Fee Committee—Orley O. Phillips, P.E., 601 Insurance Bldg., Denver, Colo.

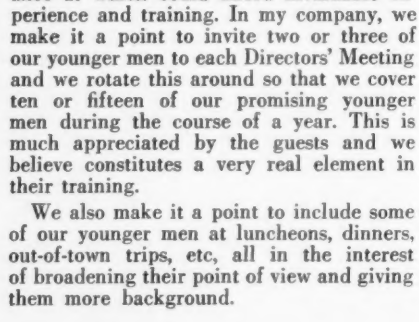
Young Engineers Committee—E. W. Carlton, P.E., 203 E. 2nd St., Rolla, Mo.

man just starting in at a job than to "do whatever is assigned to you, the very best you possibly can." If this advice is followed over a period of years, and if the man has fair ability to start with, his future will be assured in the vast majority of cases.

Somewhere along the line, it will gradually become fairly clear as to which young men are showing the most promise. This is a point at which management has an important responsibility and one which it all too often falls down on. It is now up to management to work out a series of assignments which will give to its promising young men a varied experience, extending over a period of years, in different phases of the company's activities. This is, in effect, job rotation. Frequently, there arises the question of added expense, too much overhead, etc. I firmly believe that this fear is erroneous nine times out of ten. If the man being trained for the future is as promising as he should be at this stage, he will pull his own weight in the boat and more. Even if this were not the case, what better investment can be made than the proper training of those men who are to make up the management team a few years hence.

It is comparatively easy to invite trainees to attend important executive conferences so that they can become familiar with the problems which need to be solved, and to observe how these problems are dealt with by experienced executives. Unfortunately, it is all too easy for busy men to forget to invite trainees to such meetings, attendance at which could afford invaluable experience and training. In my company, we make it a point to invite two or three of our younger men to each Directors' Meeting and we rotate this around so that we cover ten or fifteen of our promising younger men during the course of a year. This is much appreciated by the guests and we believe constitutes a very real element in their training.

We also make it a point to include some of our younger men at luncheons, dinners, out-of-town trips, etc, all in the interest of broadening their point of view and giving them more background.



(EDITOR'S NOTE: *All those desiring to list their meetings under Dates to Remember should send* COMPLETE *information, including date and place, directly to the American Engineer.*)

Indiana Society of Professional Engineers—Annual Meeting. November 6, 7. Severin Hotel, Indianapolis, Indiana.

NSPE Board of Directors Meeting—November 6, 7. Severin Hotel, Indianapolis, Indiana.

Virginia Society of Professional Engineers—Annual meeting, November 13, 14. George Mason Hotel, Alexandria, Virginia.

Communication between top management and the men somewhat lower down the line is most important, and again is often sadly neglected. The best form of communication is, of course, to hear it directly from the horse's mouth, the horse in this case being some member of the top management team. We make a very real point of calling our principal men together to inform them of promotions, financing and expansion plans, and other important happenings. We think it is very important for our supervisory group and some others to be informed by word of mouth rather than to read it in tomorrow's papers. We do not use our bulletin boards for such purposes. The company magazine is a helpful medium for transmitting certain types of information, and we always include in it a simplified digest of what appears in the Annual Report to Stockholders. All these things play a part in the training of our younger men. Monthly meetings of foremen and supervisors attended by management are an important factor, as are frequent meetings between department heads and management.

We have developed a very helpful and, we believe, unique form of flexible organization chart which was described in "Chemical Week" for January 3rd, 1953. These charts are really a visual-aid personnel spotter and can easily be adjusted to reflect changes in organization and titles. They are arranged to flag which men will retire in the near future, and which men are technically trained. Each man's training and experience prior to and after hiring, together with his age, length of service, etc., are recorded on a removable card which also carries his photograph. We have found this device to be very helpful in showing up replacements which are going to have to be made in the near future, and even in selecting men to fill the vacancies indicated.

We are doing our best to have an able runner-up for each important management job and each of our top management team fully realizes that one of the surest ways to get ahead is to develop an able man who can step into his job and hopefully fill it even better than he can. It has been very gratifying to me to see how widespread this viewpoint has now become.

Advanced management or business administration courses at many of the universities are playing an increasingly important part in the training of executives. Increasing enrollment in these courses, with the bills footed by the company, is a very direct commentary on the value management attaches to them. Generally speaking, these courses run from one to three months, although some require as much as a year away from the job.

Too many companies have been caught unprepared and forced into hasty emergency selections when an important vacancy suddenly arose due to illness, resignation, retirement, transfer or promotion. Those companies who have carried on adequate executive training programs are much more likely to be found prepared, and should have little or no difficulty in picking the right man almost immediately to fill the created vacancy.

Some companies, such as McCormick and Co., base their plans for upgrading management men on "junior boards." These boards may include a junior board of directors reporting to the senior board, a factory board, a sales board, and others, all very interestingly described in "Business Week" for June 11th, 1949.

Standard Oil (N.J.)'s talent search to beat the executive shortage as described in

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(For Advertising Representatives, See page 4)

"Business Week," December 10th, 1949, has received wide publicity as his Minnesota Mining's "Delegation of Authority" setup in the September 24th, 1949, issue of the same magazine. And there are a great many more.

Chapin Tyler of duPont has made his own personal study of what he thinks are the outstanding characteristics of the best executives he knows, and in the May, 1951, issue of *Chemical Engineering Progress*, he summarizes his findings. They are so excellent and agree so closely with my own views, that I am going to take the liberty of presenting them as follows:

1) *Energy and Drive*

"This characteristic is manifest by great capacity for work, coupled with constructive direction of personal effort. One is impressed that such drive is directed at achieving results for the organization rather than primarily for self. Furthermore, this manifestation of energy is infective; it tends to impel or motivate effort in others."

2) *Effective Intelligence*

"Because the executive spends so much time working with people, there is a tendency to overlook his role as a thinker. Actually the proper sequence in executive effort is thought followed by action. In spite of the staff assistance which an executive must have, a point is reached in every situation where the executive finds himself alone, figuratively speaking. He must 'think the problem through' which means (a) defining the problem, (b) resolving it, and (c) deciding on a practical course of action."

3) *Effective Relationships with People*

"From the executive viewpoint, people fall into three groups—superiors, associates, and subordinates. But far from being conscious of rank, the man of executive calibre strives to have equally good working relationships with all three groups. With respect to superiors, he takes orders and accepts constructive criticism without resentment; with respect to associates he is unstintingly collaborative; with respect to subordinates he strives to evoke cooperative effort rather than to impose authority. This last factor is sometimes called leadership ability."

The purpose of executive development and training is to develop more and more men who can qualify under these three important characteristics. In my opinion, if a man has these three traits he has a good chance to go clear to the top. A great deal depends upon the man himself; a great deal also depends upon management's doing its part of the job.

W. H. Byrne Takes Honorary N. Y. Post

William H. Byrne, a prominent engineering executive and member of the NYSSPE, has recently been sworn in as honorary deputy commissioner of the New York City Department of Commerce. In announcing the appointment, Commissioner of Commerce Walter T. Shirley said, "It is gratifying to know that our department will be able to enjoy the advice and counsel of such an outstanding engineer as Mr. Byrne in the solution of the many problems confronting our commercial and industrial community."

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Mayoralty Candidates Address Akron Meeting

J. P. Riddle, Republican, and Leo Berg, Democrat, candidates for the office of mayor of Akron, Ohio, were guest speakers at the October meeting of the Akron District SPE. The event, which took place October 6, was held at the Akron Liedertafel.

M.D.s', Dentists', Lawyers', Engrs.', Incomes Cited

The NSPE Salary and Income Survey has evoked considerable interest from the membership, other organizations and government agencies. A number of inquiries have been received bearing on the question of comparisons with the other professions.

To provide pertinent available information for this purpose, the AMERICAN ENGINEER publishes below the latest available statistics covering the incomes of doctors, lawyers, dentists and professional engineers covered in a previous survey.

This information is published, however, with the important qualification that note must be taken of the differences in the survey groups as compared to the recent NSPE survey. Also it should be noted that the reports for the other groups refer to different years.

Table No. 1 is from the July 1952, issue of *Survey of Current Business*, published by the United States Commerce Department. In addition to the difference in years covered, it should be observed that the surveyed groups were considerably smaller than the more than 12,000 NSPE members who reported in the NSPE survey.

Table No. 2 consists of extracted information from the 1949-50 Survey of Selected Engineering Personnel, conducted for the Department of Defense by the Bureau of Labor Statistics, covering approximately 57,000 full members of 18 participating engineering societies, including NSPE. The following note from the report is applicable to the selected tables: "Engineers in this study are a select group, consisting chiefly of senior members of engineering societies."

ANNUAL INCOME OF ENGINEERS 35 YEARS OF AGE AND OVER, BY AGE GROUP, 1949-50

Annual income	Total	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 years and over
Median	$ 8,100	$ 7,000	$ 7,700	$ 8,300	$ 8,800	$ 9,100	$10,200	$ 8,800	$ 8,800
Lower quartile	6,200	5,700	6,100	6,400	6,800	6,800	6,700	6,300	5,700
Upper quartile	10,900	8,900	10,100	11,000	12,600	14,300	14,000	13,900	13,700
Total number reporting	36,385	7,775	7,841	6,990	5,366	4,004	2,955	1,289	165

MEDIAN ANNUAL INCOME OF ENGINEERS 35 YEARS OF AGE AND OVER, BY AGE AND FIELD OF EMPLOYMENT, 1949-50

Field of employment	Total	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 years and over
Chemical engineering	$ 9,000	$ 7,600	$ 8,700	$10,000	$10,600	$12,900	$11,200	$10,500	–
Civil engineering	7,100	6,500	6,700	7,300	7,700	8,000	8,000	7,800	$ 7,000
Electrical engineering	8,000	6,900	7,800	8,300	8,400	8,800	9,500	10,100	–
Mechanical engineering	8,400	7,300	8,200	8,700	8,400	9,500	9,500	9,000	11,000
Mining and metallurgical engineering	8,000	6,600	7,500	8,400	9,100	10,100	10,300	10,700	8,300
Other engineering	9,100	7,900	8,800	9,600	10,600	11,000	11,000	11,000	–

MEDIAN AND QUARTILE ANNUAL INCOMES OF ENGINEERS 35 YEARS OF AGE AND OVER AND TYPE OF EMPLOYER, 1949-50

Type of employer and annual income	Total	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 years and over
	All educational levels								
Educational institutions									
Median	$ 7,100	$ 6,400	$ 7,100	$ 7,500	$ 7,300	$ 7,800	$ 7,700	$ 7,400	–
Lower quartile	5,800	5,200	5,800	6,100	5,900	6,200	6,100	5,700	–
Upper quartile	8,900	7,900	9,100	9,000	9,000	9,700	9,500	9,900	–
Government									
Median	6,600	6,100	6,400	6,600	6,800	7,100	6,900	6,800	$ 5,800
Lower quartile	5,400	5,200	5,400	5,500	5,700	5,800	5,600	5,400	4,400
Upper quartile	8,100	7,200	7,800	8,000	8,400	8,600	8,700	8,700	7,200
Independent consultant									
Median	10,700	9,100	10,100	10,800	12,800	12,100	11,100	10,100	10,300
Lower quartile	7,600	6,500	7,400	7,900	8,900	8,300	7,700	6,300	6,800
Upper quartile	16,600	12,400	15,200	16,100	17,000	17,000	17,000	16,600	12,700
Employer or owner of business									
Median	14,700	10,200	12,000	14,900	17,000	17,000	17,000	17,000	15,000
Lower quartile	9,800	7,500	8,600	10,200	11,400	12,800	11,700	11,200	9,700
Upper quartile	17,000	14,900	17,000	17,000	17,000	17,000	17,000	17,000	17,000
Private industry employee									
Median	8,400	7,300	8,100	8,700	9,300	10,000	10,000	10,200	9,300
Lower quartile	6,500	5,900	6,400	6,900	7,200	7,300	7,300	7,000	6,200
Upper quartile	11,400	9,000	10,500	11,700	13,100	15,400	15,600	16,600	17,000

Table 2.

AVERAGE NET AND GROSS INCOMES OF PHYSICIANS, DENTISTS, AND LAWYERS BY FORM OF PRACTICE, 1949-51[1]

Form of practice[2]	PHYSICIANS 1949 amount	1950 amount	1951 amount	Per cent change 1949-50	Per cent change 1950-51	Number of cases in sample	DENTISTS 1949 amount	1950 amount	1951 amount	Per cent change 1949-50	Per cent change 1950-51	Number of cases in sample	LAWYERS 1949 amount	1950 amount	1951 amount	Per cent change 1949-50	Per cent change 1950-51	Number of cases in sample
NET INCOME[3]																		
All: Median	$8,835	$9,311	$10,285	+ 5.4	+10.5	639	$5,970	$6,178	$6,501	+3.5	+5.2	624	$6,386	$6,625	$6,956	+3.8	+5.0	926
Major independent: Median	9,668	10,578	11,382	+ 9.4	+ 7.6	413	6,137	6,390	6,669	+4.1	+4.4	581	5,964	6,178	6,766	+3.6	+9.5	611
Major salaried: Median	7,555	7,876	8,675	+ 4.2	+10.2	226	5,382	(4)	(4)	(4)	(4)	43	6,691	7,033	7,100	+5.1	+1.0	306
Nonsalaried: Median	9,561	10,518	11,191	+10.0	+ 6.4	349	6,140	6,342	6,684	+3.3	+5.4	539	5,787	6,010	6,307	+3.9	+4.9	559
All-salaried: Median	7,678	8,087	8,829	+ 5.3	+ 9.2	165	5,982	(4)	(4)	(4)	(4)	29	7,254	7,421	7,811	+2.3	+5.3	216
GROSS INCOME[5]																		
Major independent: Median	(6)	(6)	(6)	+ 4.2	+ 9.7	413	10,874	10,998	11,977	+1.1	+8.9	581	(6)	(6)	(6)	+2.2	+7.6	611
Nonsalaried: Median	16,108	16,599	18,169	+ 3.0	+ 9.5	349	11,077	11,057	12,024	— .2	+8.7	539	8,096	8,366	8,997	+3.3	+7.5	559

[1] The percentages shown in this table were obtained directly from the interim surveys. The means and medians, on the other hand, represent bench-mark data obtained from the large-scale Office of Business Economics professional surveys or bench-mark data extrapolated by the percent changes indicated by the interim surveys.

[2] The breakdown by form of practice is based upon source of income. When based upon major source of income "all" practitioners fall into two categories: "major independent" and "major salaried." Alternatively, they may be classified according to sole source of income: "nonsalaried," "part-salaried," "all-salaried." No data for "part-salaried," which comprises a relatively small proportion of all practitioners in these professions, are included in the table because of the smallness of the sample.

[3] "Net income" refers to salaried income from professional work plus income from independent professional practice. All nonprofessional income is excluded, and all income is before payment of income taxes.

[4] Too few cases to permit presentation.

[5] "Gross income" refers to gross business receipts from independent professional practice only; it always excludes salaried income as well as receipts from nonprofessional practice.

[6] Data not available.

Source: U. S. Department of Commerce, Office of Business Economics.

Table 1.

Witness

(*Continued from page* 18)

witness on the basis of personal interest in the outcome of a case. Accordingly, it is unwise and, in fact unethical to accept a fee contingent upon the outcome of a case. It is generally advisable to charge on a time basis depending on the amount of time involved. This usually includes an allowance for travelling time to and from the court. It is well to bear in mind that the fee basis should be made known in advance to those who will be expected to pay the bill, and *agreed to by them.* However, in some instances, because of excessive or intolerable demands, the expert witness has been subpoenaed to testify without fee.

In connection with the above, it is recommended that the witness leave the courtroom as soon as he has presented testimony. He should not wait around lest he be considered an interested party in the case, and lest he be discredited for having no practice to occupy his time. However, by his leaving directly, the jury will consider that the witness is willing to stand on his testimony. By the same token, one should not read or whisper in court, but should comport himself in a dignified manner so as to reflect his dignity upon himself and upon the court.

Another bit of advice: The witness should not assume he knows it all nor give that impression. The opposition is probably prepared to a large extent and may, in fact have been briefed before coming to court. The lawyer may unsuspectingly lead the cross-examination into muddy waters for the witness, leading him to contradict or correct himself. This is detrimental to the impression he wants to establish.

In this brief article, it has not been possible to record all of the important considerations for an expert witness preparing to enter court for the purpose of presenting his testimony and/or evidence. However, several salient factors have been brought out:

1. Do not argue with the attorney.
2. Comport one's self with dignity.
3. Establish an air of authority and qualification for the presentation of the testimony.
4. Present the testimony in a clearly understood manner on a layman's level.

With these thoughts in mind, the professional engineer should have no difficulty in creating a favorable impression.—***End.***

Letters

(*Continued from page* 5)

the objective of public relations experts of N.S.P.E. and to get good coverage in *Life, Fortune, Look, Reader's Digest,* etc.

I have only recently gotten my license and become a member of N.S.P.E. after having been a sales engineer for some time. It is my first impression that the N.S.P.E. membership would like to see even more evidence that their money paid into the Society is being used to get greater recognition before the public. Since you include public relations as No. 1 on your "hit parade" of activities, I hope that something will come out that will bring greater satisfaction to present members and be a point that can be stressed in campaigning for more members from among the remainder of 525,000 "engineers" in the country.

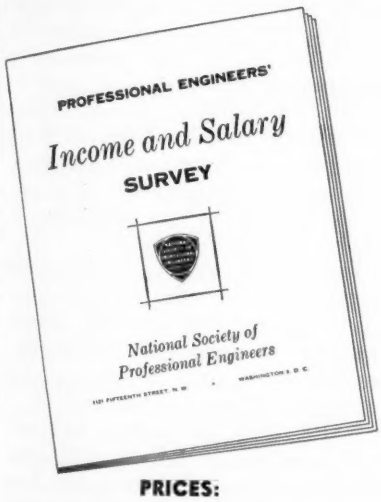
As another contribution to unity through professionalism as sponsored by N.S.P.E., it would seem that there may be merit to an "annual report" which would stress what the Society has done each year in various areas of activities. Public relations could be treated by stating the number of news releases issued, number of instances of favorable attention which have been gained in magazines, the number of radio and TV broadcasts, etc., etc. It would also seem desirable to give statistics on income and expenditures in total and through the pie-shaped treatment to indicate the percent of the dollar income from dues which is channeled into various activities.

It is hoped that there may be something additive in the above which was longer than I had intended. It may even be entirely lacking of anything new since I am so new in the Society and I don't know all of the things which are taken care of and are routine in the course of a year. I am, however, well aware of the subject of unity and if it is wanted, I'd like to help it along. I use the "if" because I'm not presently sure that it's the answer except that a unity program may be one way for individuals and the profession as a whole to get recognition in the eyes of the general public. But the program, in my opinion, must be sponsored by a group which can afford to keep high-priced talent continually at work on the matter of public relations.

Thanks for having printed Mr. Shoch's splendid article . . .

R. Cutts, Jr., P.E.,
Chairman, Program Committee,
Schenectady Chapter, NYSSPE,
Schenectady, N. Y.

► For Member Cutts' information, the Society does publish an Annual Report. One covering the administrative year, 1952-53, will shortly be mailed to all members.—*Editor.*



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DO WE HAVE ENOUGH ENGINEERS?

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

THERE has been much written in the technical and public press referring to the high demand for engineers at the present time and the probable needs of our country in the next few years for expanding technological development. Scientific manpower, its supply and utilization, has undoubtedly been the concern of more committees, groups, and governmental organizations than any other single topic in the last few years. The concern has been acute, not only because of the extensive demands of mechanized defense, but also because of the expanding economy of our country and the corresponding need for more technically developed products and services.

At the same time, there has appeared a population cycle reflecting the low birth rate of the depression '30s, which has decreased the number of high school graduates. While it is true that there is a higher percentage of college students now entering our engineering schools than ever before, the total numbers are producing less graduate engineers than will be needed for the next several years. Statistics, however, appear to indicate that 1954 will be the year of the least engineering student graduations and that an increasing number of engineers will be forthcoming from our institutions of higher education from that time on.

One of the most pressing problems as the Korean emergency developed was the necessity for the establishment of sound policies for balancing the supply of technological manpower between the military needs of the country and the civilian and defense-supporting activities. There was, of course, the immediate problem of the draft and of appropriate deferment policies so that technological training would be held at as high a standard as possible. Representatives of the National Society appeared before several Congressional Committees, expressing points of view on this important subject as well as on the need for adequate legislative and administrative policy with respect to recall of technically-trained personnel into the Armed Services. In addition, representatives of the Society worked with governmental committees and agencies in studies of this problem.

The Board of Directors at its 1951 Fall Meeting adopted a policy statement on the *Engineering Profession and National Security*. Members of the Society who would like copies of this statement may secure them by writing to the headquarters office.

As more and more publicity was being given to the supply of engineering personnel, units of the professional society were being called upon more and more for guidance and information. Local Chapters of NSPE have been active for a number of years in vocational guidance with high school students, and this activity was further encouraged with the idea of presenting to qualified young people the exact picture of what might be expected in the engineering profession. Chapter guidance people have endeavored to present the feeling that those with scientific and mechanical aptitudes would undoubtedly find a rewarding career in engineering. For the most part, however, our Chapters have urged that young people should not enter the engineering profession unless they have assured themselves that they are interested in an engineering career and have the particular aptitudes which will make such a career an enjoyable one. They have endeavored not to overglamorize the opportunities in engineering or to encourage young people to take engineering training simply because "it is the thing to do."

Again taking a realistic look at the statistics, NSPE recognized that although it could be expected more and more young people would enter the profession in the future, the needs of the nation for engineering services could be met during '52 to '58 only as the trained and available engineering personnel could be utilized more efficiently. Thus it was that the Professional Engineers Conference Board for Industry began its Executive Research Surveys on better utilization of engineering personnel.

The first of these studies found one of the most pressing problems in engineering - management communication, and the first survey report presented the experiences of industry in resolving this problem.

The second survey report was aimed directly at the specific problem of better utilization and presented the experience of some 400 engineering companies in their review and improved use of engineering skill.

NSPE feels the surface has only been scratched in this important area. While it is true that much has been done to publicize the high demand for engineers, the immediate future of both the profession and the country relies on the continued improvement in the utilization of engineering skills. No longer can the country afford to use graduate engineers in subprofessional or quasi-professional work. It is incumbent upon management, the users of engineering services, and the profession to exert every effort possible to see that professional engineers with their training, experience, and skills be utilized at their highest potential.

With Our Members . . .

Missouri Meeting

Annual Event in Columbia Features Major Addresses, Panel Discussions

The annual meeting of the Missouri Society of Professional Engineers was held October 16-17 at the Tiger Hotel in Columbia, Mo. The two-day affair included business, professional, and social events and a special program for the ladies.

During the course of the meeting major addresses were delivered by T. Carr Forrest, Jr., president of the National Society; C. Y. Thomas, an NSPE vice president; The Honorable Raymond R. Tucker, mayor of St. Louis; C. G. Roush, manager, Missouri Valley District, Westinghouse Electric Corp.; and Dr. John H. Furbay, director of Air World Education for Trans World Airlines, Inc.

Another highlight of the meeting was the panel discussion on the training and utilization of engineers, which was moderated by J. W. Hubler, professor of civil engineering at Washington University. Among the panel's participants were: C. M. Lytle, manager of engineering, Kansas City Power and Light Co.; B. H. Crosland, assistant chief engineer, St. Louis-San Francisco Railway Co.; and William Roa of Sverdrup & Parcel, Inc.

Garvin H. Dyer of Independence, Mo., is president of the Missouri group.

Delaware SPE Members Get Civic Appointments

Clarence H. Evans, a charter member and past president of the Delaware Society of Professional Engineers, has been appointed to a four-year term as a member of the State Board of Registration for Professional Engineers and Land Surveyors. Mr. Evans, a Georgia Tech chemical engineering graduate, is currently employed as supervisor of the Engineering Evaluations Consultants, Engineering Department, E. I. du Pont de Nemours & Co., Inc., in Wilmington. He has been with the company since 1929. His appointment to the State Board was made by Governor J. Caleb Boggs.

In addition, two directors of the Delaware Society have recently been assigned to new posts with the state government. Col. William A. McWilliams has been named chief engineer of the State Highway Department, and Walter B. McKendrick, Jr., has been made manager of the Delaware Memorial Bridge. Mr. McKendrick has also recently been appointed chairman of the Governor's Committee for the Promotion of Highway Safety.

Success Crowns Massachusetts Radio Show

A ninety-seven per cent favorable and complimentary response for its *Romance of Engineering* radio series has been reported by the Massachusetts Society of Professional Engineers after a tabulation of the comments received by letter, postcard, and phone. The 13-week series, which was broadcast over Boston station WEEI, was originated and prepared by MSPE members W. F. Ryan and B. W. Whitehurst.

Two New Chapters In Pennsylvania

The Pennsylvania SPE has reported the recent formation of two new chapters.

The first, which will be known as the Fayette Chapter, was organized at a recent dinner meeting held in Uniontown, Pa., and arranged by PSPE members Charles A. Burchfield, Jesse Core, and Harry Blackford. Thirty-five of the engineers present at the meeting signified their desire to become members of the new unit, and temporary officers were elected as follows: Charles Burchfield, president; Jesse F. Core, secretary; and Richard Maize, state director.

The second chapter was formed during a meeting at Danville, Pa. A name has not as yet been selected, but the area that it will cover will include the upper portion of Columbia County, Montour County, the upper portion of Northumberland County, and all of Snyder and Union Counties. This area was formerly served by the Susquehanna Chapter; but the travel distance involved in getting to Williamsport, where most of the Susquehanna meetings are held, necessitated the establishment of a second chapter in order to attract more interested P.E.'s. Temporary officers have also been elected by the second group. They include: W. D. Garman, chairman; Robert G. Zimmerman, secretary-treasurer, and W. D. Leinbach, state director.

A.S.M.E. President Addresses Tulsa Chapter

F. S. Blackall, Jr., national president of the American Society of Mechanical Engineers, recently addressed a joint dinner meeting of the Tulsa Chapter, Oklahoma SPE, and the Mid-Continent Section, A.S.M.E.

. . . more news on page 37

ACHIEVEMENT RECOGNIZED—The official U. S. Navy photo at the left shows Lt. (j.g.) L. N. Rydland, a Lansing, Michigan, E.I.T., receiving a Bureau of Yards and Docks award for his paper on *Airport Surface Treatment for Jet Aircraft*. Navy Capt. E. E. Saunders is making the presentation to Lt. Rydland who is now serving at the Marine Corps Air Station, Kaneohe Bay, Hawaii. At the right, two of the first and two of the newest New York P.E.'s join hands prior to a recent testimonial dinner honoring Dr. D. B. Steinman for his 24 years' service on the N. Y. Board of Examiners; the P.E.'s are, l. to r., Ben Dundee, Dr. Steinman, Cynthia Gross, and Dr. John C. Riedel.

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Directory Continued on Next Page . . .

Rio Grande Valley P.E.'s Honor T. C. Forrest, Jr.

T. Carr Forrest, Jr., NSPE president, was honored guest and featured speaker at a recent meeting sponsored by the Rio Grande Valley Chapter of the Texas SPE. The subject of Mr. Forrest's address was *The Chapter's Role in NSPE Programs.*

The audience also included a large group of engineers from the Nueces Chapter meeting jointly with the Rio Grande Valley group, and Nueces Chapter President Millard H. Allen also addressed the assembly.

Pharr, Texas, was the locale of the meeting, and those in attendance were welcomed by T. H. Settles, president of the host chapter. W. G. Staggs of the Chapter Activities Committee introduced Mr. Forrest to the engineers and their guests.

Kansas Eastern Chapter Holds Dinner Meeting

National Vice President C. Y. Thomas was one of the featured speakers at the October dinner meeting sponsored by the Eastern Chapter, Kansas SPE. He discussed his activities as chairman of the Kansas Ethics and Practices Committee.

Mr. Monty Bell, district engineer for the Atchison, Topeka and Santa Fe Railway Company, was another guest speaker. Introduced by Leo Brooks of the Program Committee, Mr. Bell explained various phases of the Santa Fe improvement program and outlined many of the problems that confront the professional engineer working in the railroad industry.

The meeting was held at Holiday House, Kansas City, Kan., with Malcolm Steele, president of the Eastern Chapter, officiating.

. . . more news on page 39

TWIN CITIES LUNCHEON GUESTS —Twin Cities members of the Minnesota Society of Professional Engineers were hosts recently at a luncheon honoring Miss Lucille Piete, a professional engineer with General Motors, who was visiting Minneapolis with the "Worlds in Motion" show. Left to right in the photo are: Dr. Jose Calva, president of the Minneapolis Chapter; Miss Piete, the guest of honor; and Edward Kishel, president of the Capitol Chapter, MSPE.

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By MRS. FRANK W. CHAPPELL
Chairman, NSPE Ladies' Advisory Committee

The Ladies' Auxiliary to the Sabine Chapter, Texas SPE, held a tea on October 14 at the Gulf States Utilities Company service center in Beaumont. Mrs. J. Reagan, Mrs. P. Simon, and Mrs. F. C. Cordsen were in charge of the arrangements.

A Champaign County Chapter Auxiliary has just been formed in Illinois, the third such unit of the ISPE. Still another new auxiliary is being formed in Wichita, Kansas.

The Dallas, Tex., Chapter Auxiliary has recently published a new Year Book. Mrs. E. T. Crook is the president of the group.

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What's New

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VERSATILE DRAWING INSTRUMENT — Item 1

Here's a versatile new instrument for drawing dexterity, the Glide-Rule. Transparent, capable of rolling in two directions, combines important engineer's tools in one —triangles, T-squares, straight edge, scales, protractor and parallel rules . . . in effect, a "pocket-portable" drafting machine. For precision drawing in the field, the Glide-Rule is easily carried in the pocket. (Size 2½" x 9".) Has extremely accurate, engraved scales and protractor; four drawing edges with scales in 16ths and 20ths; the protractor is a full 180°, with emphasized 30°, 45° and 60° angles.

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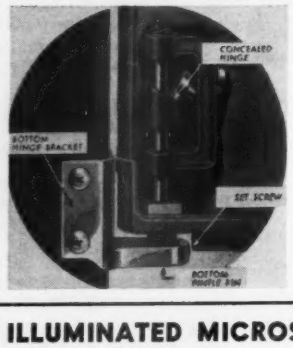
NEW CONCEALED DOOR HINGE — Item 2



A new type of hinge suspension for compartment doors which provides first, for free swing of the door, and then, positive control of the swing, has been introduced by The Sanymetal Products Co., Inc. The full suspended load and weight of the door rests on a frictionless-type thrust ball bearing instead of the usual cam mechanism. Its unusual adjustment feature permits the door to be set for rest position at any desired angle—left-hand or right-hand, in-swing or out-swing, or for double action.

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ILLUMINATED MICROSCOPE-READER — Item 3

The Pacific Transducer Corporation announces a new low-cost Brinnell microscope-reader. Concentrated illumination of the indentation field is from a beam of light provided by a prefocussed battery-type illuminator. Has magnification of 20 diameters. Indentation can be seen easily and clearly. Device can also be used wherever a microscope is needed to make all other flat measurements within the range of 7.0 mm, also for all other shop and laboratory uses where medium magnification is required.

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NOTEBOOK FOR ENGINEERS — Item 4

The Notebook used by Robell Laboratories was designed SPECIFICALLY for Engineers. This 8½ x 11 Notebook is subtly ruled for sketches, graphs, columnar calculations and data, as well as for longhand notes. Spaces are provided on every page for Engineer's and Witness' signatures and dates.

The Notebook is designed to conserve Engineering Manpower. For instance, it is indexed, so that every entry on any subject can be immediately located. Another feature is the accessory pad of carboned sheets which provide a copy of any entry, whenever one is required.

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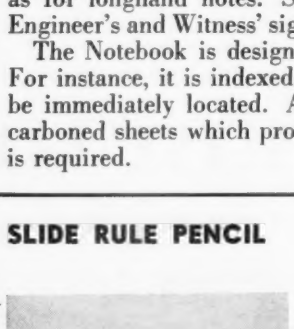
SLIDE RULE PENCIL — Item 5



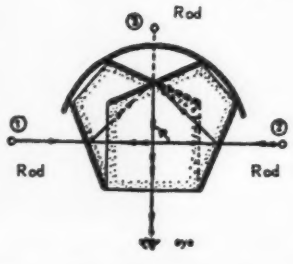
A versatile, complete vest-pocket slide rule combines a two-color pencil and a reading magnifier; also a depth gage, extendable detaching straight-edge measure, eraser, lead chamber, and a pocket clip-cursor. This Ten-in-One metal and plastic *"DEVCO"* instrument has A, B, C, D, L, S, T, OM & IN scales permanently marked by a new, especially developed debossing process. Weighs under 1 oz. Mfr. Device Development Co.

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

DOUBLE PENTAGONAL PRISM

Item 6

An exceedingly useful time and labor saving device, especially for surveying, is the Double Pentagonal Prism of Geo-Optics Company, Inc. It bends the line of sight 90° in both directions, putting the observer on a straight line between two points. (Rods 1 and 2.) Prism can be used to measure all 90 and 180 degree angles on property survey. Instrument is about the size of a plumb-bob but weighs much less. Bob is attachable to hook on bottom.



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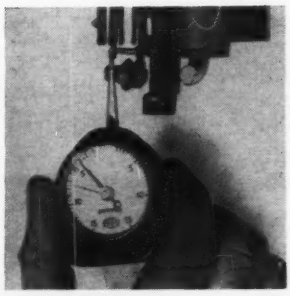
PRECISION DYNAMOMETER

Item 7

The George Scherr Company announces a New Precision Dynamometer for measuring spring tension, starting torque and the force required to actuate delicate mechanisms. A highly valuable aid to the inspector or engineer in determining the pressure required to overcome spring tension and other kinds of resistance in fine precision mechanisms such as Electric Contacts — Relays — Telephones — Clocks — Business Machines—Micro-Motors for Electric Razors, etc. Eliminates constant watching. Hand will stop and remain set at highest point of test until reset.



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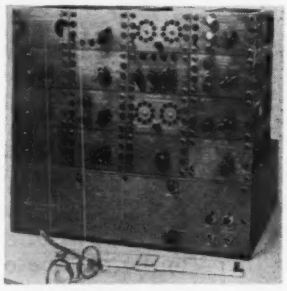
ELECTRONIC MODULAR SYSTEM

Item 8

A basic new electronic tool of great flexibility in the design and use of pulse methods for information transmission, storage and computation is announced by Audio Products Corporation. Called the MODULAR SYSTEM of digital pulse units, the system consists of sixteen electrically and mechanically compatible "Modulars" which perform all the basic functions of digital pulse operations, such as gating, pulse forming, counting, coincidence marking, etc., as well as simpler electronic tasks like amplification, signal inversion and impedance matching.



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CONSTRUCTION PHONE MOUTHPIECE

Item 9

The CONFIDENCER by Roanwell Corporation is a microphone of exclusive design which permits speech to be transmitted clearly while neutralizing unwanted noises. It is similar in outward appearance and is physically interchangeable with the mouthpiece and transmitter of most telephones. Neutralization of unwanted noises, caused by riveting machines, trucks, bulldozers, etc., is accomplished by directing the noise through special sound chambers to both sides of the diaphragm. However, when one talks directly into the microphone, the sound unbalances the diaphragm acoustically so that the desired signal is transmitted in a normal manner. Approved by Bell Telephone Co.

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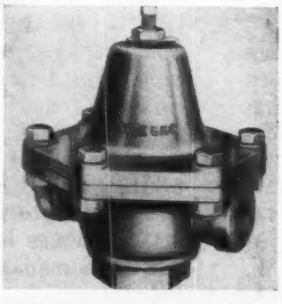
AUTOMATIC REGULATING VALVES

Item 10

Cash-Acme announces a completely new series of Automatic Pressure Reducing and Regulating Valves intended primarily for use on Bunker "C" oil service, as well as other dirty liquids or fluids with a high viscosity. All sizes are of the direct acting, single seated, spring loaded diaphragm type pressure reducing and regulating valve, which automatically reduces a high pressure to a lower pressure and maintains that lower pressure at a constant. The valves are fully self-contained, with simple pressure adjustments.



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Strictly Business

Industrial Exhibitions . . . The PLANT MAINTENANCE & ENGINEERING SHOW (formerly called the Plant Maintenance Show) has been scheduled for January 25-28, 1954, at the International Amphitheatre in Chicago, according to CLAPP & POLIAK, INC., of New York, producers of the exposition. It will be supplemented by the PLANT MAINTENANCE & ENGINEERING CONFERENCE, also sponsored by CLAPP & POLIAK, Jan. 25-27, at the Hotel Conrad Hilton . . . The seventh annual ELECTRICAL INDUSTRY SHOW, sponsored by the ELECTRICAL MAINTENANCE ENGINEERS ASSOCIATION OF SOUTHERN CALIFORNIA, has been set for April 1-3, 1954, at the Shrine Exposition Hall, Los Angeles, Cal.

►

New Firm . . . DON E. GROVE, consulting engineer and president of OPTIONICS ENGINEERING CORPORATION OF LOS ANGELES, and CARLISLE F. MANAUGH, owner of PLANT ENGINEERING COMPANY, have formed a partnership and opened new offices in Los Angeles. The firm, GROVE & MANAUGH, will specialize in parking and traffic problems and in the development of automatic materials handling equipment.

►

Operational Expansion . . . The WESTINGHOUSE ELECTRIC CORPORATION plans to build a multi-million dollar, ultra-modern packaged air conditioning plant near Staunton, Va. The plant will be operated by the Westinghouse Air Conditioning Division, headquartered in Hyde Park, Mass. . . . A new AMERICAN CYANAMID COMPANY plant for the manufacture of titanium dioxide pigments will be built at Savannah, Georgia, by the CHEMICAL CONSTRUCTION CORP. The new plant will be operated by the Calco Chemical Division of AMERICAN CYANAMID. . . . RICHMOND SCREW ANCHOR CO., INC., of Brooklyn, N. Y., manufacturer of form tying devices for concrete construction, has announced the completion of a new branch factory in St. Joseph, Mo. . . . AMERICAN-MARIETTA CO., Chicago, has become the nation's largest manufacturer of concrete pipe following its acquisition of controlling interest in the UNIVERSAL CONCRETE PIPE CO., Columbus, O.

►

Personalities . . . DONALD H. HERAK has been appointed district engineer of the Spokane, Washington, office of the PORTLAND CEMENT ASSOCIATION. . . . T. M. LINVILLE is the new manager of Research Operating Services, GENERAL ELECTRIC COMPANY, Schenectady, N. Y. . . . GEORGE WHITE, JR., has been elected executive vice president of the VITRO CORPORATION OF AMERICA, according to word from J. CARLTON WARD, JR., president. . . . CLARENCE E. KILLEBREW, a mechanical engineer, has been named manager for marketing and sales of the Construction Machinery Division, CLARK EQUIPMENT COMPANY, Michigan manufacturers of materials handling equipment, according to GEORGE SPATTA, president. . . . DR. W. E. HANFORD, vice president in charge of research and development of THE M. W. KELLOGG COMPANY, has been elected a director of PULLMAN INCORPORATED, of which Kellogg is a subsidiary.

Mr. Killebrew

Col. Rockwell

The WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., has announced the following appointments: EDWARD B. DAWSON is the new engineering manager for the Elevator Division; W. B. BULLOCK has been named eastern district manager in the same division and will assume the new post in New York City; and FRANK L. SNYDER, a vice president of the Corporation, has reassumed management of the firm's Transformer Division at Sharon, Pa., while the former division manager, CHRIS H. BARTLETT, attends the Harvard School for Advanced Management prior to taking another assignment. . . . COL. WILLARD F. ROCKWELL, who has recently resigned as assistant to the Secretary of Defense, has returned to his position as chairman of the board of directors of ROCKWELL MANUFACTURING COMPANY, Pittsburgh, Pa. . . . The election of ARTHUR G. RANSLOW as vice president in charge of Production and of CHARLES R. DAVIS as vice president, West Coast District, and the appointment of H. ERICH NIETSCH as manager, Industrial Division, have been announced by C. S. ROBINSON, president of ROBINSON AVIATION, INC., vibration control engineers.

Mr. Pasini

Changes in production posts with THE DETROIT EDISON COMPANY include: the promotion of ROBERT M. VAN DUZER, former assistant chief engineer of power plants, to the position of general superintendent of production; the appointment of ALBERT C. PASINI as assistant general superintendent of production; the naming of GEORGE F. CAMPAU to succeed Mr. Pasini as superintendent of the company's new St. Clair Power Plant; and the appointment of CLARENCE H. CLARK as superintendent of the Marysville Power Plant with STEWART D. HOETGER as his assistant. . . . WILLIAM M. STAPLES has been named to the post of manager of construction by the CHEMICAL CONSTRUCTION CORPORATION, and AMERICAN CYANAMID COMPANY unit. . . . KENNETH VAN KAMPEN has been named general superintendent of the WARNER ELECTRIC BRAKE & CLUTCH COMPANY, Beloit, Wis.

As a supplement to his duties as vice president and director of THE ELECTRIC STORAGE BATTERY COMPANY, ROLAND WHITEHURST has been appointed general manager of the Industrial Products Division. ROBERT L. SOMMERVILLE, assistant general sales manager of the same firm, has been appointed general manager of the company's newly-formed automotive products division; and WILLIAM C. LEINGANG has been made assistant general manager of the division. . . . ELMER H. WEGNER has been appointed general manager of manufacturing for the CLEAVER-BROOKS COMPANY, Milwaukee, Wis. . . . WILLIAM RODGERS has been elected vice president and general sales manager of BLAW-KNOX COMPANY, Pittsburgh, Pa.